



TANGANYIKA TERRITORY

DEPARTMENT OF AGRICULTURE

Annual Report

1930

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DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT FOR 1930.

REPORT OF THE DIRECTOR.

STAFF.

The Director arrived in the Territory in October and took control of the Department from Mr. H. Wolfe, who left the following month to take up the appointment of Deputy Director of Agriculture, Kenya. During the course of the year the following changes were recorded :—

Mr. A. E. Haarer, District Agricultural Officer, was appointed to the post of Agricultural Lecturer.

Mr. W. J. Hill, District Agricultural Officer, was retired on medical grounds.

Messrs. H. Marsland and T. C. Cairns, Cotton Investigators, were appointed District Agricultural Officers.

Messrs. J. R. Curry, N. R. Fuggles and G. W. Lock from the Imperial College of Tropical Agriculture, Trinidad, Messrs. R. M. Davies and D. Thornton, on transfer from Nigeria, Mr. R. B. Allnutt and Mr. F. W. Thomas arrived on first appointment as District Agricultural Officers.

Messrs. R. H. Dick, T. M. W. Sheppard and D. H. R. Lyon, Agricultural Assistants, left the service.

Messrs. A. Taylor, J. S. Scott, W. Sibley-Warne, R. Shaw, G. H. Pattison, C. J. M. Krige, T. D. K. Ferreira and W. C. Clarke were appointed as Agricultural Assistants.

At the close of the year the authorised European staff was as follows :—

Head Office: Director, Deputy Director, Agricultural Economist and three clerks.

Scientific Staff: Entomologist, Mycologist, Assistant Entomologist and Plant Breeder.

The appointment of Plant Breeder was not filled during the year.

Field Staff: Four Senior Agricultural Officers, Agricultural Lecturer, twenty-seven District Agricultural Officers, Head Gardener (Botanic Gardens) and fourteen Agricultural Assistants.

In Appendix I is shown the distribution of the staff by districts.

FINANCE.

FINANCIAL YEAR 1930-31.

The financial provision and expenditure for the financial year is summarised below :—

<i>Provision.</i>	£	<i>Actual Expenditure.</i>	£
Personal Emoluments ...	38,081	Personal Emoluments...	35,997
Other Charges ...	29,019	Other Charges ...	26,494
Special Expenditure ...	950	Special Expenditure ...	934
		Extraordinary Expenditure ...	542
Total ...	£68,050	Total ...	£63,967

The expenditure is classified as follows :—

	£
Expenditure solely for the benefit of natives ...	38,478
Expenditure benefitting both natives and non-natives ...	22,436
Expenditure on purely non-native services ...	3,053
Total ...	£63,967

About November the financial situation in the Territory demanded that the most careful economy should be exercised and savings were aimed at. Furthermore, the estimates for the year current were revised, and any hope of increasing personnel and activities or any development requiring new money was thus ruled out, and further cuts and economies demanded. Of the provision under "Other Charges" the sum of £7,515 was committed for contributions to various services, and £542 to Extraordinary Expenditure, over which the Director had no control and on which savings could not be made locally. This has thrown an excessive burden on the small remaining balance available for expenditure on the services of the Department proper. Analysis reveals the extraordinarily small sum remaining for the work of the Department and the maintenance of the activities of a large field staff operating over very large areas. Economy was essential and was effected, a saving of £2,525 under Other Charges proper being secured, and it is hoped that by internal reorganisation to a certain extent the funds available will meet in some measure the demands of, at any rate, the major portion of the Territory. The net savings on the estimates of the Department was £4,083.

This Territory is so vast and the conditions in widely separated areas are so different that it is essential to group areas for the purpose of crop investigation and general agricultural management. Internal communication too is so slow and distances are so great that it is not possible for staff to be moved freely.

Even when grouped the areas themselves present difficulties connected with transport. For instance, Babati and Mbulu are so remote from existing departmental organisations that they cannot be served adequately if at all.

Further, the important group of Rungwe, Njombe, the lower end of Ufipa and of Iringa is very difficult to serve on account of distances, the scattered nature of development in the area and paucity of staff. Further, the Mahenge-Kilombero area is not served at all, Tabora and Kondoa have no agricultural staff.

It is clear, however, that economy of funds can be effected by concentration on specific areas in an attempt to improve agricultural practice and quality of produce specially, and to-day is not the time to expand services.

Attention should, however, be drawn to the fewness in the numbers of scientific officers employed by the Department. There are two entomologists and one mycologist. A chemist is required; until accommodation is available, however, the Department cannot expand its scientific work. Now that the functions of Amani are becoming more properly defined and understood, it is not idle to hope for a strengthening of this section of departmental activities.

In view of the need for economy in printing, this report is somewhat abridged from the report originally drawn up and it has been re-arranged so as to cover the calendar year up to 31st December, 1930, instead of up to 31st March, 1931. The reorganisation and adjustment necessary due to the establishment of Circles was completed towards the close of the year so that the next year's report, which will be issued early, will cover a full year under Circle organisation.

The aid of the Colonial Development Commissioners has been sought in connection with—

- (i) an experiment station to deal mainly with coffee to be situated in the North-Eastern Circle;
- (ii) a tobacco experiment station to be established in the Iringa Province;
- (iii) the appointment of a Chemist for sisal and soil investigation to be stationed at Amani but to serve the Department specially;
- (iv) the cost of a long visit from a highly qualified Tea expert, to advise as to the steps to take to establish and develop the industry.

The development of assistance to the non-native is progressing gradually. On the establishment of stations for coffee and tobacco generally, in common with native people, planters and companies will be better served. The sisal industry is hardly served and should receive consideration. The Department is now in a position to give assistance and advice to tea planters in the Southern Highlands and to advise directly on the Turkish tobacco crop, and in the Northern Province to study the condition of the coffee crop from various angles. Much, however, still remains to be done, which can be done only through and by means of the stations mentioned above.

Distribution of tung-oil seeds continued, there are no outstanding successes; there is promise that almonds may prove a profitable crop. Tea appears to be attracting more attention and good reports have been received, a free issue of tea seed in Rungwe was commenced towards the end of the year. The plantation coffee industry in the Southern Highlands is progressing slowly. For sisal the comparison of the fibre yield of the thornless type found by Mr. Haarer with that of the common sisal has commenced. There

is unfortunately no move to establish a local sugar industry, no development of pineapple growing, no establishment of grape fruit and other citrus growing industry. There are no canneries established or contemplated but they all must come in due course.

The adjuncts to farming in the highlands, such as cattle, pigs and poultry must be considered in suitable areas by those planters who are trying to establish themselves, as without them they will achieve only modified success, if any.

The almost entire absence of terracing, contour drainage, and cover-cropping from the practice on plantations and particularly amongst native peoples is noteworthy and efforts have been directed to this most important section of cultivation and lay-out.

Native people will derive much benefit from the experimental stations when established, as even though they may have no interest in sisal for instance, the alternate and intercalary planting will undoubtedly be of use to them in their agriculture. In the other stations contemplated, their interests are practically identical with those of the planter. It is, however, in the improvement of their food-crops in type and yield that the Department is mainly concerned together with the cash crops, tobacco, rice, groundnuts, simsim, coffee and cotton. New varieties of many crops are brought in for trial each season.

There is a strong move for the establishment of Native Treasury Seed Farms, on scale, following the success achieved at Ibadakuli. It is hoped to secure the reservation of a large compact block of land in every large district or group of districts for development in the near or the not too far future into a seed farm, with farm school training of native pupils, with a small experimental area adjoining. It is expected that many other activities will eventually locate themselves on or near these central farms.

A matter of special interest, which has arisen through coffee, and, if a workable scheme can be evolved, will spread to other cash crops, is the formation of the native co-operative group. Especially in connection with the new native tobacco plantings in Songea and Tunduru it is hoped to have a producers' organisation. With powerful and active co-operation, quality of bulk produce can be assured. However, these matters are in the stage of examination and no doubt in time a method will be evolved which may require the technical and business assistance of non-native factory managers as production develops.

GENERAL REVIEW OF THE YEAR 1930.

The year under review was somewhat over normal as regards the general yields of the various crops, but there was everywhere a shortfall in the production of cotton and a failure to record in the production of food crops in the areas lying to the south-west, namely Songea, Tunduru and Mahenge, with some slight shortage in Kilosa.

The generality of the areas, however, enjoyed a good season. There was a record groundnut crop, due mainly to the very favourable conditions prevailing in those areas suited to the crop. It is, nevertheless, unpleasant to

record that the whole crop could not be brought to market owing to the extremely low price offered for this form of produce towards the end of the season.

In June, 1930, the Headquarters of the Department were moved from Dar es Salaam to Morogoro, an inland town some one hundred and forty miles from the coast.

The Department is becoming organised in the Provinces; circles comprising two or more provinces have been formed and, practically speaking, sub-departments have been set up; they cover about half the area of the country. Elsewhere, generally the remotest places, there is no particular local organisation but it is the policy gradually to absorb into existing circles those districts adjacent as the road systems develop, or to set up new circles when development warrants it.

Thus, the *North-Eastern Circle*, comprising the Tanga and the Northern Provinces, is staffed by one Senior Agricultural Officer, one Entomologist, five District Agricultural Officers and two Agricultural Assistants. The projected development in this circle is a Coffee Experimental Station. The area served by the officers of the North-Eastern Circle is perhaps the most important in the Territory and certainly is the highest in point of development, with much scope for further advance. It produces quite half of the exports of the Territory from both native and non-native effort.

The *North-Western Circle*, comprising the Provinces of Bukoba, Mwanza and Tabora, is staffed by one Senior Agricultural Officer, seven District Agricultural Officers and five Agricultural Assistants. The production is almost entirely native in origin and again susceptible of greater development in due course.

The *South-Eastern Circle*, comprising the Province of Lindi with the district of Songea, is staffed by one Senior Agricultural Officer, three District Agricultural Officers and one Agricultural Assistant. Apart from sisal and copra products by non-native enterprise, the production of this area is of low order and needs development.

The Provinces Mahenge, Iringa, Kigoma, Central and Eastern are not organised in circles. The Department is not represented in the Mahenge Province; the Eastern Province, as also the Iringa Province, is inadequately served by two District Agricultural Officers and two Agricultural Assistants. Kigoma Province, which is almost as large as Iringa Province, has one District Agricultural Officer and one Agricultural Assistant. The Central Province has two District Agricultural Officers. The work of these officers is supervised from Head Office, with the limitations imposed by distance and comparative postal inaccessibility. Agricultural officers have each several native instructors in their charge.

The agricultural stations are situated at Morogoro, Ibadakuli, Mpanganya, and Mpapura. They are really trial stations, the officers in charge each have a district to attend to. There are no stations established specifically for experimental work of any volume, save perhaps, Morogoro. In addition, the Department maintains the Botanic Gardens in Dar es Salaam and a small number of sub-stations or farms in native areas. The investigational and experimental side of departmental work has been somewhat starved; despite

this, a considerable amount of useful information has been secured and officers are working very keenly in order to record at least a few facts.

Native production, which was developed over a period of years when good prices were secured, received a severe check when the decline in prices was felt and not only was a more restricted area planted, but some of the crop was not brought to market and yet other portions were never harvested. These conditions, coupled with other considerations, have exerted and may continue to exert a restrictive pressure on native effort. It was well pointed out to the native at the end of 1930 that if he desired to maintain his old cash income, he should either farm better or do more farming, or both. Native production based on annual crops is liable to excessive fluctuations of output, not alone on account of variable seasons, but also because at any time, if he feels so inclined, the native may refrain from planting a cash crop and limits his activities. Under present circumstances he cannot be expected to be a steady and reliable producer of surplus from annual crops.

Even with permanent crops such as coffee and copra there comes a time when the native peasant will not particularly exert himself to gather his harvest, and at the same time he neglects his cultivation. High prices followed by heavy falls have much to answer for, but the excessive value placed on his working time and his produce by the average native is somewhat amazing. It is trusted that this is a passing phase and an adjustment to a more reasonable attitude will in due course eventuate, as of course it must.

NON-NATIVE EFFORT.

Sisal under the stimulus of lowering prices shows increased out-turn, but here again a reduction of tonnage is to be expected eventually. Speculative cotton planting on a falling market in some cases has resulted in the abandonment of the crop before harvesting, a bad object lesson to native people and a great encouragement to rodent pests.

With coffee, on account of the low net return for the crop, the inability of the planters to liquidate the cash advances made to them is likely to affect adversely the production of coffee in the future, as plantations in some instances are not maintained in a sufficiently good state of cultivation and pests such as the Borer are not checked soon enough to save the trees.

However, although money has to be paid out by the planter community in advance of the realisation of the harvest, there is not so significant a reduction in effort on account of low prices as with the native who pays out little or nothing in the course of production. Some better balance in the relative volume of these two kinds of effort is surely needed to steady up the export tonnage production from the Territory. A combination of the two, with the non-native undertaking the technical final preparation of the produce, with native co-operation in production, may possibly help to steady the volume of out-turn.

PROGRESS OF CHIEF EXPORT CROPS.

COTTON.

The cotton crop is not making headway. It is subjected to such control that it must be irksome to grower and buyer alike. Without some control

the crop would rapidly deteriorate and pests would inevitably multiply. It is quite suitable as a crop for native production for cash purposes, yet very unsuitable on account of the special conditions of control, check, regeneration, storage and so forth, surrounding it. Furthermore, in spite of active propaganda, it is almost invariably planted too late to give maximum returns. The recent deterioration in the average quality of the total cotton lint exported is due to the relatively increased amount of plantation grown cotton which is crop picked and not sorted. Some natives in the Dar es Salaam District are planting acreages so large that they say it is an impossible task to pick in qualities, thus we have strangely enough large scale enterprise affecting the export quality of a crop. Unless the first month's pickings are made on quality and the seed from the first quality reserved for next year's planting deterioration will rapidly take place and our cotton will lose practically all its premium which would possibly result in the elimination of the crop, on account of the relatively poor prices which it will fetch in competition on the overseas market.

The output of lint from ginneries (a list of which is given in Appendix III) of the seasonal crops from 1927 to 1930 is given below:—

Province	In pounds				Difference per cent.	
	1927	1928	1929	1930	1929	1930
Eastern	2,839,710	7,506,758	6,982,400	5,291,182	— 7	—24
Tabora ...	410,892	478,701	98,000	111,800	—75	+14
Mwanza	2,648,995	4,422,357	3,012,800	3,325,489	—32	+10
Lindi ...	340,620	525,726	784,800	371,541	+32	—53
Tanga ...	52,239	106,721	127,199	68,500	+19	—46
Northern ...	93,999	105,134	70,800	52,650	—34	—26
Bukoba ...	—	36,127	38,090	33,104	+ 5	—13
Total ...	6,386,455	13,181,524	11,114,089	9,254,266	—15	—17
Bales ...	15,966	32,954	27,785	23,135		

The share of estate (non-native) production in 1930 was recorded as 7,902 bales (of 400 pounds each) or 34 per cent. of the total (as compared with 35 per cent. in 1929) and divided by districts as follows:—

Dar es Salaam District	... 1,546 bales	Rufiji District	 23 bales
Morogoro District	... 2,599 "	Lindi District	 75 "
Kilosa District	... 3,289 "	Northern Province	 52 "
Bagamoyo District	... 200 "	Mwanza Province	 118 "

The greater portion of the estate-grown cotton is produced in the sisal growing areas of Kilosa, Morogoro and Dar es Salaam Districts, as an interplanted crop with young sisal.

The sales of seed-cotton by natives during the 1930 season are shown in the following table, following similar tables in the previous annual reports:—

Area	1st Quality	2nd Quality	3rd Quality	Total	Value
	Kgs.	Kgs.	Kgs.	Kgs.	Shs.
Morogoro-Kilosa ...	1,143,955	240,976	266,766	1,651,697	340,802
Rufiji ...	77,133	24,288	38,849	140,270	20,625
Bagamoyo ...	425,579	17,021	44,966	487,566	90,000
Lindi and Mikindani ...	173,120	35,056	69,725	277,901	45,556
Pare and Handeni ...	90,072	19,355	24,822	134,249	25,561
Tabora Province ...	188,170	21,305	21,780	231,255	42,071
Mwanza Province ...	4,320,725	530,198	—	4,850,923	1,012,906
Biharamulo ...	43,408	—	7,595	51,003	5,810

The minimum prices paid were fixed by the Department and were on a sliding scale based on the Liverpool four months' futures and the cost of transport of the lint from the ginnery to the coast. The range of prices, following those recorded in former annual reports, was as follows (in cents of a shilling per kilogramme):—

Centre	1st Quality		2nd Quality		3rd Quality	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
Ngerengere ...	30	23	22	12	15	6
Kilosa ...	32	21	22	8	12	4
Mikese ...	32	23	22	8	16	4
Kimamba ...	35	20	25	8	10	4
Bagamoyo ...	32	12	22	3	16	2
Mohoro (Rufiji) ...	21	20	13	12	10	10
Kilimani ...	19	14	11	6	9	5
Lindi ...	25	18	17	11	12	9
Mikindani ...	23	18	15	9	11	8
Masasi ...	17	17	10	10	8	8
Nausio (Mwanza) ...	31	17	—	—	11	4
Missungwe ...	33	17	—	—	11	4
Usogore (Shinyanga) ...	22	18	18	13	9	7
Biharamulo ...	13	11	—	—	7	4

This crop was established on boom prices, its future bristles with difficulties which are accentuated by the ginning problem. Tanganyika is over-ginned, and in many places buying facilities are excessive.

Cotton Board and Cotton Cess. A Cotton Board was appointed to advise Government in regard to the business end of the industry and a cotton cess was imposed amounting to half a cent per pound of native seed-cotton sold.

The proceeds of the fund so created are utilised in making payment to ginneries for cotton seed requisitioned for planting purposes, for the bagging and transporting of the same, and to pay for the expense of the supervision of cotton markets, and cotton buying generally. The following table gives

the total amount of cess revenue collected, together with a summary of the expenditure under the various sub-heads:—

		£
Total Revenue Cotton Cess 1930/31 ...	...	3,893
Expenditure 1930/31 :—		
		£
Purchase of seed ...	...	1,227
Cost of bags ...	...	100
Transport ...	...	664
Salaries of Supervisors ...	...	555
Railway fares and freight ...	...	193
Purchase of tents, scales, etc. ...	...	209
		£2,948
Excess of Revenue over Expenditure		£ 945

The cotton cess is not an ideal method of securing the native his seed supply and the whole subject needs very careful examination.

COFFEE.

This is developing in various areas. The old-established areas of Kilimanjaro, Meru and Bukoba are well known. Newer areas are Bugufi, Mbosi, Dabaga, Mbeya and Mulindi. Babati and Mbulu are also being developed. On the Pares and the Uambaras, the crop is making little or no headway. Musoma is under examination.

The quality of Tanganyika Arabica coffee, judging by the relative prices received during the past year, is not on the up grade. Coffee growing in the Northern Province presents problems comparable with those elsewhere, but they should be resolved in due course. Fortunately neither "coffee bean borer" nor the "mealy bug" have appeared in the cultivations and every endeavour will be made to keep the district free of infection. The culture of the crop in this important area requires close study.

It is hoped that concurrently with attempts to limit soil wash in plantations by contour works, by cover cropping, and restricted and sound irrigation, that the need for organic manures produced on the spot will be realised. Were it possible for coffee farmers to run small herds of cattle or to secure supplies of boma manure, one would be more hopeful as regards the permanence of the plantations. This applies to both native and non-native and the maintenance or possibly the improvement of the quality of coffee produced.

In Bukoba where there is mainly a Robusta industry, the problem of "quality of produce" is the dominating one. Whatever a grower may do to eliminate pests such as bean borers, whatever care he may take over the preparation of his berry, the prevailing flat rate method of buying denies him any reward for his care and industry. Unless this is changed, as changed it can be, no improvement can be made. Bukoba cleaning is not near the root of the problem, that will only improve the appearance of the produce; the influence must be got back to the grower, so that a greater proportion if not all the dry cherry will be really dry and sound. In July, on the very strong representations of traders in Bukoba, merchants in Mombasa and principals in London, the regulations which it was intended to apply in

connection with the grading and inspection of coffee in Bukoba, were suspended indefinitely. That some inspection must be applied is obvious but it is essential to have some semblance of agreement as to the necessity for grading and inspection.

The figures of production in the chief coffee areas in 1930 and the previous two years were as follows:—

	1928 Cwts.	1929 Cwts.	1930 Cwts.
Bukoba	156,640	135,880	147,380
Northern Province ...	45,732	37,942	65,820
Usambara District	5,604	2,898	4,140

The Bukoba production is almost entirely grown by natives and chiefly (63 per cent.) of the Robusta type; the remainder (37 per cent.) is Arabica coffee. The total exports and estimated values of estate and native coffee in 1928, 1929 and 1930 were:—

			1928		1929		1930	
			Cwts.	£	Cwts.	£	Cwts.	£
Estate			43,772	220,286	29,409	134,709	67,540	165,309
Native			164,850	519,361	147,731	454,162	163,400	231,731
Total			208,622	739,647	177,140	588,871	230,940	397,040

The fall in the realised unit value of both native and non-native coffee should be noted.

TEA.

This is being grown or established on a commercial scale in three main areas:

- (i) the Usambaras where a large estate is approaching the producing stage;
- (ii) the Mufindi area where plantations are expanding but where production is at present insignificant;
- (iii) the Rungwe area where expansion is taking place, and production has commenced from one small factory. Small consignments of tea have sold at prices running from 1s. 8d. to 2s. 2d. per pound in London.

The conditions appear to be suitable to the production of good quality tea. The lack of development money is acutely felt and the planting up to now has unfortunately not all been on the contour. Failure to check erosion completely from the moment of clearing of the area is a phase which it is trusted will pass, and planters must realise that for the permanence of their crop and the safeguarding of their capital they must conserve their soil asset from the commencement.

One condition of the free issue of tea seed made in Rungwe at the end of the year is that the plants must be put out in an approved fashion. This means contour planting and contour level troughing as a minim, combined with cover-cropping.

It is important for the maintenance and expansion of this industry that adequate finance and manufacturing facilities be provided, otherwise the efforts made will be practically abortive. It is hoped that the situation will be sufficiently explored and the necessary commercial backing be secured. Further, insufficient consideration has been given as regards the "jat" of seed imported for the establishment of plantations, this phase is now happily passing and planters can be advised fairly definitely as to what type to plant.

SISAL.

In point of production this fibre goes from one record to another, just as the market on which it depends has dropped during the year from one record low price to another. The 50,000 ton mark is within sight but output at present prices represents the loss of so much development capital, and unless there is a change in prices for the better coupled with a reduction in total production cost, the industry will suffer a serious set-back.

The problems of sisal production thus suddenly apparent, and but tardily regarded, have come as it were all at once. There is no alternative crop of which sufficient is known to enable planters to spread their risk. Cotton at low prices is an intercalary crop of questionable utility, food-crops are produced in profusion in the neighbourhood, or there is a cheap surplus of *posho* from Kenya.

At one time there was a request for a bounty on export which wisely did not find support. A possible help in order to maintain the regeneration sequence would be small monthly advances for the purpose. The whole economy of the sisal estate is undergoing an overhaul, pruning of staff, wages, expenses and increase in output, demands for the lowering of fixed charges, these all have come into tribute to the reduction of costs of output per ton to cope with an unwilling market. The slump has set managers, directors and workers thinking in terms of cents, it should give an impetus to the development of improved machines for the recovery of fibre of which over 25 per cent. of that originally in the leaf is destroyed in the process of recovery. It will cause combinations and possibly concerted marketing. It may bring the industrial end of the business to the Territory, but it is a very serious phase, being met with more than ordinary ability and fortitude.

Exports of sisal by areas for the last three years were:—

	1928 Tons		1929 Tons		1930 Tons
Tanga	26,500	...	35,313	...	37,827
Morogoro and Dar es Salaam	5,652	...	6,279	...	7,813
Lindi	2,374	...	2,871	...	3,319
Mikindani	393	...	464	...	781
Moshi	1,253	...	789	...	159
Other areas (mainly Mwanza)	14	...	12	...	63
Total ...	36,186	...	45,728	...	49,962

GROUNDNUTS.

The exports of this crop for the year is a record in quantity and would have been considerably higher if prices had remained anywhere near normal.

The exports for the last three years were 10,595 tons, 7,765 tons and 17,333 tons respectively. The chief areas of production are the Mwanza, Tabora and Central Provinces and the Lindi and Mikindani Districts.

Its value as a rotation crop in native agriculture is appreciated and it possesses the merit in the eyes of the native of being less troublesome than cotton and much more his own style of crop. Unfortunately when prices fall the native producer simply does not trouble to market what he has reaped, possibly because he thinks he is being swindled by the buyers. The boom price years have much to answer for, and the methods of marketing admit of improvement.

COPRA.

The export figures as compared with the previous two seasons are as follows, increased use of this product for the local manufacture of soap probably accounting for the small reduction in the quantity exported:—

			1928 Tons		1929 Tons		1930 Tons
Tanga-Pangani	...	...	4,152	...	2,813	...	2,972
Mafia...	...	...	1,626	...	1,699	...	1,619
Dar es Salaam and Bagamoyo	...	...	2,941	...	2,800	...	2,455
Kilwa-Lindi	...	...	599	...	608	...	349
Total	...	...	9,318	...	7,920	...	7,395

Actually the prices obtained for copra are so low that the coast people will not trouble to prepare it, and further are prone to neglect their plantations. Difficulties are experienced in trying to make bankrupt plantation owners keep their plantations clear of pests and dead trees.

SIMSIM.

Decreased prices for this product and an unfavourable season for the crop resulted in a drop in exports, which for the years 1928, 1929 and 1930 were as follows:—

			1928 Tons		1929 Tons		1930 Tons
Lindi	...	...	1,888	...	2,789	...	2,106
Mwanza	...	...	428	...	478	...	435
Kilwa	...	...	580	...	447	...	414
Other areas	...	...	319	...	542	...	160
Total	...	...	3,215	...	4,256	...	3,115

It should be more largely grown, and the white seeded variety should be multiplied extensively.

GRAINS.

The total exports of rice, millets, maize and pulses for the year were 143,818 cwt., valued at £88,065, as compared with 160,924 cwt., valued

at £95,091 in 1929. In the following table the exports of rice, millets and maize are given from the chief areas of production:—

	1928		1929		1930	
	Tons	Percentage of total	Tons	Percentage of total	Tons	Percentage of total
Rice, Mwanza	2,126	53	1,726	66	3,087	68
Millets, Lindi	5,323	69	3,509	73	1,296	71
Maize, Tanga	305	22	37	11	97	41
„ Lindi	535	38	323	89	125	59

This quantity was shipped by lake steamer to Kenya and Uganda; the total export from the Province in 1930 amounted to 5,891 tons.

The rice crop is increasing and the needs of the three territories could be produced in Tanganyika, the quality of the clean rice being excellent.

There is no strong organisation for dealing with gramineous food-stuffs so that large contracts go to Kenya for maize and *posho*.

VARIOUS PRODUCTS.

The detailed figures of produce railed (not necessarily for export) from some of the chief producing areas of the Territory are as follows:—

	1928 Cwts.	1929 Cwts.	1930 Cwts.
RICE —			
Mwanza Province	42,520	47,960	117,820
Tabora „	20,600	5,700	17,080
Lindi „	16,480	4,240	19,840
GROUNDNUTS—			
Mwanza Province	46,925	33,980	172,280
Tabora „	106,375	88,320	159,940
Central „	47,160	26,920	45,840
Lindi „	8,240	10,680	11,280
GRAIN (Millets, Maize and Pulses)—			
Mwanza Province	5,640	18,272*	2,378*
Tabora „	52,820	55,520	34,540
Central „	42,840	—	60,240
Lindi „	141,321	85,074	43,217
BEESWAX —			
Tabora, Dodoma and Morogoro	8,185	4,784	2,590
Mwanza	262	263	150
Lindi	1,169	1,619	872
Kilwa	128	72	29
Other Stations	71	43	132
GUM ARABIC			
Mwanza and Northern Tabora	13,398	20,327	9,362
Tabora Province	12,580	22,090	5,820
MANGROVE BARK—			
Kilwa	69,740	69,540	59,840
Rufiji	95,700	40,600	45,734

*Through Mwanza Customs only.

				1928 Tons		1929 Tons		1930 Tons
CHILLIES	...	...	...	192	...	65	...	125
RAW SUGAR	...	...	...	901	...	500	...	414
MOLASSES	...	...	...	1,134	...	456	...	429
KAPOK	...	...	...	1,020	...	2,300	...	1,280

OTHER CROPS.

Tobacco. Attempts are being made to establish a nucleus Turkish tobacco industry in Iringa, and to develop the production of Heavy Western, fire-cured Virginian to meet the internal demand for cigarette tobaccos. There appears to be some ground for anticipating that these two types will be more largely grown in the future. The Department has one officer in Iringa who is able to experiment and advise on tobacco growing and further staff trained in tobacco work is employed in the Lindi Province.

The production of Turkish tobacco has reached three tons, and of fire-cured Virginian eight tons.

Sugar cane. Only a very small quantity of jaggree, or brown cake sugar, is produced in the Territory and there is ample scope for the development of sugar production in the future should it be found necessary, in order to support other industries. The price of white sugar is excessively high in relation to world prices, the production of sugar in Kenya and Uganda is said to be sufficiently great to cover the demands of all three territories at present, but the establishment of a sugar plantation with factory in Tanganyika should be considered.

Wheat. Wheat has been and is being produced in the Southern Highlands. There are no milling facilities, and unless organised there can be but little increase in production. Natives in the south-western area use a certain amount of wheat as food.

Fruit. The small citrus production in the neighbourhood of Muhesa in the hands of natives is not developing nor may it be expected to do so when the people are too slothful to save their citrus trees from grass fires. This matter will receive attention.

Stone fruits are being grown at Lushoto and in Iringa with some success, but there is no appreciable surplus beyond the needs of the districts. This needs investigation with a view to possible development.

Almonds, walnuts, tung-oil, cocoa and other permanent crops are being tried. Some old cocoa trees are found in bearing and interest has been aroused in the possibilities of the better quality type it may be found possible to establish, and it is proposed to examine the matter much more closely.

DETAILS OF ASSISTANCE AND PROGRESS.

The general agricultural conditions and progress are briefly given below, under the names of the Provinces.

CENTRAL PROVINCE.

A second District Agricultural Officer was stationed in this Province towards the end of the year, with his headquarters in Dodoma. The District Agricultural Officer at Singida was assisted by an Agricultural Assistant for some months, chiefly in connection with ploughing instruction, which, as yet, has made little headway in the stock areas of this Province. The African Instructors' staff varied in number between nine and seven.

A large portion of the neighbouring Mbulu District (of the Northern Province) has hitherto fallen under the care (agriculturally) of the District Agricultural Officer, Singida. The Wambulu natives are industrious and ambitious, their country is fertile and well-watered and considered to be potentially a very valuable agricultural area. A severe handicap is the distance from railhead, but the position will be considerably improved on the completion of the Manyoni-Singida line.

The seasonal conditions in this normally very dry Province were on the whole unusually favourable for the crops grown, although the rainfall greatly exceeded the average and caused in certain areas considerable damage, through flooding, to crops. The groundnut crop was appreciably less than the early forecasts; 2,292 tons were exported as compared with 1,346 tons in the previous year, but it was reported that the natives held back large quantities with the hope that prices would improve. In a good season this semi-arid area also produces large quantities of millet and sorghum grains of which 3,012 tons were railed during the year to other stations in the Territory or for export.

The sub-stations, of which there are nine in this area, are well supported from funds from the Native Treasuries. The work continued with demonstrations of better methods of cultivation, including ploughing instruction, and the growth, for distribution, of improved varieties of food crops. Particular attention was paid to the Virginia Bunch groundnut, the drought resisting and quick maturing Proso millet, white Congo and Potchefstroom Pearl maize, an awned, and therefore not so troubled by birds, variety of bulrush millet, the heavy yielding Bonganbilo sorghum, which appears to be as suitable for arid conditions as it is for the better rainfall areas of the Territory, and cassava as a provision against periods of food scarcity. The trial of salt-bush, Karroo bushes from South Africa, spineless cactus and the carob bean, all for fodder purposes, is also being continued.

The Singida Agricultural Station was closed down during the year as the site which had been chosen was not considered suitable. The experimental coffee trials on the Iramba Plateau were terminated, as the plots, over a period of four years, clearly demonstrated that the area was not suited to the cultivation of this crop.

NORTHERN PROVINCE.

Freedom from locusts has allowed departmental activities in this and the adjoining Tanga Province to make real headway again. In September, 1930, the office of the Senior Agricultural Officer, North-Eastern Circle, was reopened and transferred from Lushoto to Moshi, where this officer is more central to the activities as a whole in his circle, which includes the Tanga and Northern Provinces. A third District Agricultural Officer was added to the Agricultural staff of the Province and stationed at Arusha in January, where he is connected with both the native and estate agriculture of the district. One District Agricultural Officer for the Moshi area is concerned entirely with estate agriculture; the other with native agriculture, with two Agricultural Assistants to assist him in the supervision of the native coffee plantations on Kilimanjaro. The African Instructors' staff for the Province numbered eighteen.

The 1930 estate coffee crop on Kilimanjaro and Meru was a record one and the details of the quantity exported, together with the native coffee

production are given in the following table, with the 1929 figures for comparison :—

			1929			1930		
			Estate Tons		Native Tons	Estate Tons		Native Tons
Arusha	...	...	754	...	31	1,373	...	45
Moshi	...	...	573	...	540	1,918	...	756
Total			1,327	...	571	3,291	...	801

As in other industries, the planters have been hard-hit by the fall in prices and the maintenance and improvement of the plantations has suffered accordingly.

The native coffee industry on Kilimanjaro and Meru continues to make progress. In the former area there are nearly 13,000 growers, owning about six million trees of which some three and a half million are in bearing. The crop is marketed by their own associations of which there is one for each area. The methods of preparing the coffee for market are still unsatisfactory; at present about 1,200 small hand pulpers are used in the Moshi area alone and the owners of the pulpers do the work for the remaining growers. The fermentation of numerous small lots results in a very uneven product.

All native coffee plantings are registered and regularly inspected by the District Agricultural Officer in charge of this work, or the two Agricultural Assistants (coffee); more than 16,000 inspections were carried out during the year under review. The Senior Agricultural Officer reports :—

“The Kilimanjaro Planters’ Association and many of the more advanced natives have exerted a most helpful influence in obtaining a better observance of the Plant Pest and Disease (Coffee) Regulations. Natives on the whole are now well aware of the need for these rules, and on more than one occasion native opinion has caused the owner of unsatisfactory coffee to effect an improvement. The absent owner is the greatest problem, but here again the Association will step in. If necessary, the coffee is uprooted by order of the Senior Agricultural Officer but happily such action is rarely required.”

The proposed Coffee Experimental Station, which it is intended to open up on Kilimanjaro with the aid of the Colonial Development Fund, awaits sanction.

TANGA PROVINCE.

Departmental activity in this Province is under the direct charge of the Senior Agricultural Officer formerly at Lushoto, but now stationed at Moshi. The Province has a field staff of two District Agricultural Officers: the one stationed in Tanga, for convenience in regard to the inspection work in connection with the importation of plants under the Plant Import Regulations, is in charge of the Districts of Tanga, Pangani and Handeni; the second officer is stationed at Lushoto and has charge of the agricultural work of the Lushoto, Korogwe and Pare Districts.

The short rains of 1929 carried through, almost without a break of the usual dry period, to the long rains of 1930. The 1929-30 seasonal rains were therefore unusually heavy, as was also experienced in other areas of the Territory, and resulted in heavy grain crops being produced. The failure of

the 1930 short rains, however, caused an acute food shortage, particularly in the Handeni District.

The very heavy rains caused erosion on cultivated slopes in the Pares and Usambaras to be unusually conspicuous. Attention is being given by the Department to this problem, by carrying out trials of cover crops and contour hedges to demonstrate control measures. It is a pleasure to record that in Handeni District the Native Authorities have forbidden the cultivation of the steep slopes immediately adjoining the water courses.

The chief estate production, sisal fibre, continued to make headway as regards output in face of the low prices, and 36,480 tons were exported in 1930 as compared with 34,542 tons the previous year and 26,141 tons in 1928. New plantings have, however, been greatly restricted during the year and must result in decreased production of fibre when the present areas of sisal are worked out. An artificial dryer (the second operating in the Territory) has been installed at one estate in the Tanga District, the results of which will be watched with interest by sisal growing interests in the Territory, in view of the premium which Java sisal commands over East African, said to be due to the use of mechanical dryers turning out a fibre of better colour, although there is apparently no difference in the quality of the fibre itself.

In 1930, 207 tons of estate coffee was produced in the Usambaras as compared with 144 tons the previous year, the increase being due to a more favourable season as the industry is not making headway; the conditions in the Eastern Usambaras do not seem to be suitable for Arabica coffee, the type which has been planted mainly. As regards native coffee production in this Province, the Senior Agricultural Officer reports: "In the Pare Hills, 356 natives planted Arabica coffee some few years ago, but the conditions are entirely unsuitable and many are now uprooting their coffee and planting cotton in the adjoining plains." In 1930, only twenty bags of coffee were produced. The growers are affiliated to the Kilimanjaro Native Planters' Association. In the Western Usambaras, the number of growers of Arabica coffee has increased from two hundred in 1929 to four hundred in 1930. Only a small amount of coffee was produced in 1930 and this was sold locally, largely amongst the natives themselves for their own consumption. In the Eastern Usambaras, seventy-four natives planted Robusta coffee in 1930, and a small number are cultivating Robusta which is nearing maturity in the Nguru Hills of the Handeni District.

Cotton is only of importance in this Province in Handeni and in the Pares; in the former district it is the only cash crop suited to the general conditions of the area, while in the latter the natives are returning to the cultivation of cotton after their unsatisfactory attempts, previously mentioned, to grow coffee. The seasonal output of lint in the ginneries operating in the Province was 68,575 lbs. as compared with 127,199 lbs. the previous year; in addition to this a certain amount of seed-cotton, grown by natives in the Pares, was ginned at the Himo ginnery near Moshi. The seed-cotton was purchased by ginners, the prices paid by them being considerably above the guaranteed minimum prices which they undertook to pay.

As it was decided not to proceed with the proposed sub-tropical fruit station at Lushoto, the site was taken over by the Native Authorities for that area as a maize and potato seed-farm. Under the guidance of the District Agricultural Officer, twelve tons of Potchefstroom Pearl maize have

been produced for distribution in selected areas to the complete exclusion of other types.

EASTERN PROVINCE.

During the year the Province was served by the following Agricultural staff: one District Agricultural Officer stationed at Mpanganya; one at Morogoro, assisted by a second for the Experiment Station work during the latter half of the year and by an Agricultural Assistant; and an Agricultural Assistant for the Bagamoyo District. The number of African Instructors employed in the Morogoro and Kilosa Districts varied from twenty-three to seventeen; whilst in the Bagamoyo and Rufiji Districts, ten and nine Instructors were used respectively.

The rainfall conditions for the year were decidedly abnormal and, on the whole, unfavourable to crop growth. To begin with the heavy rains, carrying right through from December of the previous year to April of the year under review, caused severe flooding in some areas and excessive weed growth. The plantings on steep slopes in the hills suffered more than usual from erosion, as little or no attention is paid to control measures. From May onwards the rains came to a sudden end and for the next eight months a period of drought set in, when the rainfall was considerably below normal for these months. Failure of the 1930 short rains was general in the Morogoro-Kilosa areas.

The early prospects for the 1930 cotton crop were unusually bright; insect attack, however, in the main cotton growing areas of Morogoro-Kilosa, possibly due to the early cessation of the rains, was so severe as to practically prohibit boll formation during the months of July and August, whilst in the Rufiji Valley the early plantings were all destroyed by the floods. Later a general epidemic of field mice also caused much havoc to the seed-cotton.

Cotton Market Supervisors were again employed, being paid out of the cotton cess funds, and stationed at Kimamba, Mzinga and Kingolwira markets to see that the natives were paid fair prices for their seed-cotton and otherwise ensure that the Cotton Rules were observed. Owing to the general slump in prices, growers obtained very much lower prices for their seed-cotton than in the previous year. The following table gives the comparative prices paid in 1929 and in 1930 at four buying centres for first quality seed-cotton:—

Centre	1929		1930	
	Maximum cents per kilo.	Minimum cents per kilo.	Maximum cents per kilo.	Minimum cents per kilo.
Morogoro ...	46	42	30	25
Turiani ...	48	40	30	16
Kilosa ...	48	40	32	21
Kimamba ...	52	40	35	20

The output of lint from ginneries for 1929 and 1930 is given below:—

District		In bales of 400 lbs.			Difference per cent.
	1929		1930		
*Dar es Salaam	... 5,096	...	3,265	...	—35.9
Kilosa	... 5,903	...	5,667	...	— 4.0
Morogoro	... 5,599	...	3,627	...	—35.2
*Rufiji	... 347	...	126	...	—63.7
Bagamoyo	... 511	...	517	...	+ 1.1

* A considerable quantity of the seed-cotton grown in the Morogoro District is ginned at ginneries in the Dar es Salaam District; similarly Rufiji cotton is largely ginned in the Kilwa District.

The share of estate (non-native) production in 1930 was recorded as 7,657 bales (as compared with 9,084 bales in 1929), or 44 per cent. of the total, divided by districts as follows:—

Dar es Salaam District	...	...	...	1,549 bales
Morogoro	„	...	...	2,598 „
Kilosa	„	...	...	3,288 „
Rufiji	„	...	...	23 „
Bagamoyo	„	...	...	200 „

Considerable trouble in collecting the cotton cess (which is on native-grown cotton only) was experienced and there is little doubt that a good deal of native cotton was recorded as estate production.

The cultivation of sisal has received a severe set-back during the year through the slump in prices and the area of new plantings during the latter end of the year was negligible. Many estates have not been able to maintain their plantations in good condition and it is feared that this will be reflected in decreased production for the next few years. The quantities of sisal fibre and sisal tow railed from stations on the main line in 1930 were supplied by the Railway Department as follows:—

			Sisal Fibre Tons		Sisal Tow Tons		Total Tons
Soga	...	...	635	...	59	...	694
Ruvu	...	...	887	...	83	...	970
Kidugallo	...	...	1,758	...	83	...	1,841
Ngerengere	...	...	840	...	6	...	846
Kingolwira	...	...	636	...	98	...	734
Morogoro	...	...	—	...	10	...	10
Kimamba	...	...	760	...	70	...	830
Kilosa	...	...	977	...	230	...	1,207
Totals	...	...	6,493	...	639	...	7,132

Floods in the Rufiji Valley at the beginning of the year destroyed about 2,000 acres out of a total of approximately 3,000 acres of sisal in that area.

Full reports on the work of the Agricultural Stations at Morogoro and Mpanganya are given in Annexures I and III.

TABORA PROVINCE.

The activities of this Department are at present principally confined to the northern Districts of Shinyanga, Nzega and Kahama, where a District Agricultural Officer is stationed at the headquarters of each of the former two districts. An Agricultural Assistant is also available at Shinyanga for the Experiment Station work at the Ibadakuli Station and for supervision of the adjoining Tribal Farm. An average of twenty-eight African Instructors have been employed in these areas during the year; a number of these, being especially trained in the use and maintenance of ploughs and the management of ploughing oxen, are largely occupied in imparting this knowledge to native plough owners.

The heavy rains experienced in this comparatively dry Province at the beginning of the year resulted in unusually good crops (with the exception of cotton). The chief export crop is groundnuts, although large quantities

of surplus rice and grains are also produced. A comparative statement of produce raised from stations in the Province, during the years 1929 and 1930 is given below :—

	1929 Tons	1930 Tons
Groundnuts	4,416.5	7,997.5
Rice	59	29
„ paddy	226.25	825
Maize	561.75	348.25
Mealie Meal	912.25	267.5
Mtama	1,014.75	879.5
Peas and Beans	287.5	231.5
Simsim	241.25	123
Hides and Skins	352	253
Wax	119.75	64.5
Honey... ..	47.25	9.5
Sugar and Jagree	14.75	53.75
Oil	106.5	68.5
„ Cakes	151.5	100
Muhogo and Muhogo Flour... ..	1,392	680.75
Ghee	52.5	42.25
Timber	1,000	1,004
Gum	1,104.5	291
Potatoes and Onions	3.25	7.5
Tobacco, local	8.5	54.25
Cotton seed	47.25	20.25
„ ginned	82.5	33.5
„ unginned	8.75	36

The native cotton crop in this Province, although larger than the previous year, was still disappointing. The yields were low and a general lack of interest, due largely to the fall in price, exists in its cultivation. Trials of the U/4 jassid resistant type, evolved in South Africa, were carried out at the Ibadakuli Station and this variety shows promise of being considerably better suited to the conditions and capable of producing greatly increased yields as compared with the local Uganda upland type, at present being grown. A ton of seed of U/4/4/2, one of the best strains of this variety, was imported from South Africa for more extensive trial in the various cotton-growing areas of the Territory and for multiplication purposes at Lubaga near Shinyanga.

A detailed report, by the District Agricultural Officer in charge, on the Agricultural Station at Ibadakuli is given in Annexure II. Large quantities of improved varieties of maize, groundnuts, millets and other native food-crops were grown for distribution at the adjoining Native Tribal Farm; similar useful work has been carried out at the Ndomo Seed Farm in the Nzega District. Particular attention has been paid to the matter of planting only improved seed in certain areas to avoid deterioration due to contact with the local inferior varieties.

MWANZA PROVINCE.

Mwanza Province has a population of 826,653 natives. It was served, in addition to the Senior Agricultural Officer with his headquarters at

Mwanza, by the following Agricultural staff:—

Mwanza District :	...	1 District Agricultural Officer;
		1 Agricultural Assistant;
		2 Cotton Market Supervisors (for three and a half months).
Maswa District :	...	1 District Agricultural Officer (for three months);
		1 Agricultural Assistant.
Kwimba District :	...	1 Agricultural Assistant.

The increase in staff has allowed a District Agricultural Officer to be stationed in the Maswa District for the first time. An average of thirty-two African Instructors were employed, chiefly in the Mwanza District.

The favourable "small" rains which fell throughout the Province at the end of 1929 resulted in early plantings, and all crops, including cotton, were well forward by March. The "big" rains of 1930 were exceptionally heavy, particularly on Ukerewe and in the Lake shore area. These rains continued almost without a break until the middle of May, when they suddenly stopped and a long dry spell set in. These conditions favoured all crops except cotton, which suffered very considerable damage from insect attack, especially aphids and jassids, and from bud and boll shedding. The damage was most serious in the interior, though the incidence of these pests was also much above the average in other areas. The "small" rains of 1930 were irregularly distributed in most areas, and the planting of all crops was delayed, resulting in a reduction in the area under cultivation.

The quantities of produce railed to other parts of the Territory or exported through Mwanza Port from the Province are given below and show the importance of the area (excluding the Musoma District) from the point of view of production, which is almost entirely native:—

	1928		1929		1930
Cotton (bales of 400 lb.) ...	11,056	...	7,419	...	8,314
Groundnuts (tons) ...	2,236	...	1,699	...	8,614
Rice (tons) ...	2,126	...	3,087	...	5,891
Simsim (tons) ...	607	...	300	...	251

Groundnuts are the chief cash crop of the hinterland areas. The introduced Virginia Bunch variety continues to gain popularity with the native growers, due chiefly to its early maturing qualities and the ease with which it can be "lifted".

The cultivation of rice is chiefly confined to the Islands of Ukerewe and Ukara and the low-lying Lake shore areas of Mwanza and Kwimba Districts. Several types are grown, the best of which are the introduced varieties Sena and Maji Maji; unfortunately these are often grown mixed with inferior varieties. The crop is popular with the natives and a steady annual increase in the area planted is recorded; the total production in the Province for the year was estimated at 14,000 tons of which 5,942 tons of rice and 825 tons of paddy were exported. Six rice mills are operating in the Mwanza District, of which five are in Mwanza Township. Marketing conditions, developed by the mill owners for the crop, are satisfactory on the whole, although it seems that the prevention of adulteration with dirt may need the attention of the Government.

The various seed farms of the area are at present largely concerned with the trial and multiplication of U 4 cotton seed for distribution purposes. The work of growing supplies of seed of improved food-crops has been continued also; the chief need in most areas is for an increased acreage, per household, of cassava and sweet potatoes.

BUKOKA PROVINCE.

The agriculture of this Province falls under the direction of the Senior Agricultural Officer stationed in Mwanza. Two District Agricultural Officers, the one for the Bukoba District and the other for Biharamulo District, are stationed in the Province. Two Agricultural Assistants are employed in connection with the native coffee industry of Bukoba; and a third has been appointed (his salary being paid out of Native Treasuries funds) for the young native coffee growing industry in the Bugufi area of the Biharamulo District. Seventeen African Instructors and eight Pupil Instructors are also employed in the two districts; in addition, ten Instructors were employed by the Bukoba Native Administration in connection with the Native Authorities Coffee Regulations.

The export production of native-grown Bukoba coffee during the last eight years was as follows:—

Year					Robusta	Arabica	Total	Value
					Tons	Tons	Tons	£
1923	...	...	...	...	1,673	887	2,560	116,678
1924	...	...	...	...	2,869	662	3,531	234,026
1925	...	...	...	...	2,578	1,573	4,151	320,745
1926	...	...	...	...	3,579	1,071	4,650	324,094
1927	...	...	...	...	2,569	1,375	3,944	215,844
1928	...	...	...	...	5,254	2,583	7,837	478,311
1929	...	...	...	...	4,721	2,073	6,794	400,011
1930	...	...	...	...	4,660	2,706	7,366	194,010

The estimate for the year was 8,000 tons and it is considered that this record figure would actually have been surpassed were it not for the very low prices obtained, which caused considerable quantities of berry to remain unpicked; in addition to this loss, it is probable that a considerable amount is still unsold, remaining in the hands of the natives. The Customs valuation per ton for the last eight years is as follows:—

Year					Robusta £	Arabica £
1923	...	...	...	...	43.7	49.2
1924	...	...	...	...	63.0	72.0
1925	...	...	...	...	74.9	81.0
1926	...	...	...	...	68.0	75.0
1927	...	...	...	...	49.6	64.3
1928	...	...	...	...	56.8	69.7
1929	...	...	...	...	55.2	67.2
1930	...	...	...	...	22.5	32.9

The trade name for the Robusta coffee sold from this area is "Bukoba Native" and for the Arabica coffee "Bukoba Plantation".

The operation of the Native Authority Coffee Rules has been disappointing, particularly in regard to the measures provided for the control of the coffee bean borer (*Stephanoderes hampei*). Progress has, however, been made in regard to the undesirable feature of unoccupied plantations, as during the year a return of all such plantations was made in accordance with the "Native Land Rules," which provide that, in the case of a plantation not being "effectively occupied," it shall revert back to the Chief and may be given out to another person.

In the Bugufi area of the Biharamulo District, the extension of coffee planting amongst the natives has increased very considerably. Arabica coffee nurseries, chiefly of the Bourbon type, have been started at all villages throughout this area and, with the aid of the close supervision of an European Coffee Assistant, it is hoped to place a superior grade of coffee on the market in a few years' time, which should command a price sufficient to cover the high cost of transport entailed in marketing the crop, with a useful balance remaining for the growers. Attention is also being paid to the growth of this crop amongst the natives at the higher altitudes in the Kimwani area.

The seasonal conditions, due largely to the unusually heavy rainfall, were unfavourable for the growth of the cotton crop in the Biharamulo District and the total crop amounted to only 49 tons of seed-cotton. A total of 10,166 natives put in plots of cotton; approximately 40 per cent. of the plots were a complete failure and the majority of the remainder produced yields much below normal.

On the extensive sandy soils of the Rusubi and Busambiro areas, where cotton has largely failed, it was decided that tobacco may be more successful as a cash crop to the natives. Accordingly seed of the Virginian variety "Heavy Western" was imported from Nyasaland and a specially trained Native Instructor sent to supervise the trial plantings and the curing of the leaf. It is reported that there seems every chance of the crop proving a success.

Work during the year at the Nyakato sub-station in the Bukoba District has been mainly directed towards improving the soil conditions and in planting it up with Robusta coffee, selected from the best types of the district. The whole area, with the exception of three plots, which have been put under pigeon peas, has been planted up with banana shade; the rotting stems and leaves will provide a useful soil mulch. The communal village seed farms in the Bugufi area grew sufficient seed of White Congo maize to allow each hut owner (approximately 10,000) being supplied with sufficient seed for his requirements. Thus the unusual achievement of entirely replacing the local inferior maize has been attained in one season.

LINDI PROVINCE.

This Province, together with the District of Songea forms the South-Eastern Circle, under a Senior Agricultural Officer stationed at Lindi. District Agricultural Officers were stationed at Kilwa, Mpapura and Masasi and Agricultural Assistants at the latter station and at Mikindani.

The work of the Mpapura Agricultural Station is detailed in Annexure IV; it being the first year of cropping, only results of a very general nature have been obtained.

Copra is produced in the coast districts of Mikindani, Lindi and Kilwa—while sisal is produced in the first two only, being, however, the chief export crop. Exports have risen from 3,786 tons in 1929 to 4,717 tons in 1930, of total value £122,470 and £99,976 respectively. The inland areas contribute a large proportion of the chief native export products—grain, simsim and groundnuts.

1930 was a year of excellent crops and low prices, a few areas were checked by flooding but in the coastal district generally the yields were high, particularly in the case of rice and sorghum (mtama). Low prices and famine in the interior led, however, to decreased exports of grain. In the table below will be found details of the exports of the principal native products:—

Product					1930 Tons	1929 Tons
Mtama	...	...	...	...	2,003	3,928
Simsim	...	...	...	...	2,602	3,204
Groundnuts	...	...	...	...	564	534
Rice	...	...	...	...	992	212
Copra	...	...	...	...	364	596
Sale of seed-cotton by natives					392	1,061

In both Masasi and Newala Districts good harvests were reaped but Tunduru suffered a number of set-backs, resulting in famine in certain parts of the district during the year.

The work of the Mwera Tribal Farm at Mnacho (Lindi) has been reorganised. Kenya Hybrid maize is being multiplied to replace the local variety and also the Virginia Bunch groundnut and Lindi white simsim. In Masasi District it has been necessary to close the small sub-station at Nanchitika and to concentrate on a station at Masasi boma. The Newala and Tunduru sub-stations were closed through lack of funds, but in the latter district ten communal seed farms have been established as a temporary measure for famine relief purposes.

KIGOMA PROVINCE.

The Agricultural staff stationed in this Province during the major portion of the year were a District Agricultural Officer at Kasulu, an Agricultural Assistant at Sumbawanga and an Overseer of Agricultural Stations at Kasulu. There were eighteen African Instructors distributed as follows:—

Kasulu District	...	...	8
Kibondo	„	...	3
Ufipa	„	...	7 (2 in the Karema area).

Unfortunately, through shortage of staff, it will be no longer possible to station an officer at Sumbawanga and it has been decided to close down the five sub-stations opened in that area, as it will no longer be possible to give these proper supervision.

The rainfall for the Province was heavier than in the previous two years, with the exception of Kasulu, where complete records were not kept unfortunately. Ufipa in particular experienced unusually heavy rains, both on the Plateau and in the Rukwa Valley. In Kasulu the 1930-31 rains so far recorded have been light but well distributed and the crops were up to average.

During the last three years attention has been given to cotton as a cash crop for the natives in the Rukwa area (chiefly in sleeping sickness concentrations) of the Ufipa District. Trials with this crop have also been carried out very successfully in the Karema Valley, a fertile coastal valley in Northern Ufipa District. At present prices it does not appear possible to produce from outlying areas at a reasonable price to the grower.

Two half-acre coffee demonstration plots in the Kasulu area and one in the Kibondo area were established with funds supplied by the Native Treasuries.

Estate agriculture in the Nigoma Province is as yet small and is confined chiefly to the Uvinza and Sumbawanga areas, where attention is being paid to coffee, tung-oil and kapok in the former area and coffee and flax in the latter area, which is also apparently well suited for stock and mixed farming.

IRINGA PROVINCE.

During the year a second District Agricultural Officer, with a special knowledge of the cultivation of tea, was stationed in the Province with his headquarters in the Mufindi area. An Agricultural Assistant was also stationed for the first time at Tukuyu for the supervision and guidance of the native coffee industry in the district. The District Agricultural Officer in charge of the tobacco work was absent in Dar es Salaam for the first two months of the year in connection with the fermentation of experimental consignments of Turkish tobacco for the London market. He was also on leave for five months and was thus only available in his district for the remaining five months of the year.

The total rainfall for the year 1930 was much in excess of that for the previous year, an abnormally dry year. The rains in this area usually commence in December and, except for a brief interval in February, continue until May. Features of the distribution in 1930 were: no interval in February; an exceptionally high fall in March; and a notable absence of rain in December. The dry season was thus prolonged and unsuitable for perennial crops such as tea and coffee, for high temperatures are experienced and evaporation is excessive.

The encouragement and guidance of the Turkish tobacco industry in the Ifunda area has been continued. The experimental consignment of 5,000 pounds sent to London towards the close of last year realised the satisfactory average price of Shs. 2/- per pound. It is estimated that at this price, the crop can be grown at a reasonable profit. A tobacco firm in Dar es Salaam have also purchased both Turkish and Virginia tobacco grown in the Ifunda area. Cigarettes manufactured from this tobacco have now been on the market for some months and it would seem that a small local market for Turkish tobacco is now established as well as for the Virginian types. It is the overseas market, however, that has to be developed if the industry is to attain real size, and the large areas suitable for tobacco growing in the Iringa District, are intended to be utilised for this purpose.

In the Rungwe and Mufindi areas, tea planting is still extending and Government assistance has been afforded for the purchase of seed. It is estimated that a total of 450 acres of tea have been established in the Mufindi area and 180 acres in the Rungwe area, where one estate has already come into bearing. Unfortunately much of the seed obtained by planters direct from

India has given very poor germination, apparently through deterioration in transit, otherwise the total acreage planted would have been much larger. However, fresh seed of good "jat" produced on an estate near Tukuyu, is now available for distribution. Most of the plantings are situated on steep slopes, hence erosion control is most important and the District Agricultural Officer is encouraging the use of contour drains and hedges and the use of suitable cover crops, and is carrying out co-operative trials.

Estate coffee plantations in the Rungwe area show varying successes, some plantations are quite promising. Manuring is being practised and planters are very keen to adopt sound methods. Heavy transport costs are a serious handicap. In the Mufindi area the opening up of more land in coffee is continuing steadily, both in the forest areas and in the adjacent grasslands, where the coffee is reported to be making better growth. Cold winds during the dry season have to be contended with and sufficient foresight has not always been used adequately to protect the coffee plants by means of systematic wind belts of suitable trees.

Tung-oil seed of two species has been widely distributed for trial purposes to planters in this Province. Whilst the earlier reports on these trials were in some cases promising, the trees have made slow growth since being planted in the field. Their behaviour during the next year or two should give definite information as to whether or not conditions are really suitable.

There are 414,371 natives settled in this Province, who produce little in the way of crops in addition to their own food requirements. The provision of suitable cash crops in an area so distant from rail is, however, a difficult matter. The native coffee industry in Rungwe is reported to have every appearance of being a success as long as planting is confined to old banana plantations, which are comparatively fertile owing to the native practice of building the cattle houses in their midst and using the manure. Arabica coffee is being grown; there are approximately 1,300 native growers with an estimated total of 37,300 trees in bearing and an additional 169,000 seedlings planted out. Only three sub-stations have been maintained in the Province, and a keen demand has arisen for the improved varieties of food crops which were grown.

MAHENGE PROVINCE.

This large Province is served by one District Agricultural Officer stationed at Songea aided by nine African Instructors. His activities have necessarily been confined to the Songea District and concerned mainly with work in connection with the young native tobacco industry.

The exceptionally heavy rains during the rainy season of 1929-30, combined with much cloudy weather, adversely affected crop growth. The production of maize, millets and sorghums were much below normal and there was shortage of food in many parts of the Province. Some 90 tons of maize were imported from Nyasaland and distributed in the famine areas and the planting of cassava encouraged. The 1930-31 planting season, although late in commencing, has on the whole been favourable for crop production.

The most promising native cash crop for this area appears to be a heavy Virginian type of tobacco such as is being grown by the natives of Nyasaland

for export. This type is also suitable for the manufacture of cigarettes and pipe tobacco for the local native trade.

During the past few years trial plantings of cotton have been widely made in the Songea District with but little success. Some six tons of native-grown seed-cotton was produced in 1930 and disposed of at a loss to a ginnery in Lindi. With present prices it is obvious that an attractive price cannot be paid to the Songea grower, even if a ginnery were erected.

The native coffee established in the sheltered valleys of the Ungoni Plateau is reported to be making satisfactory progress, but the seedlings distributed elsewhere have largely failed to survive. Kenya governor wheat, introduced by the Department, has been found to yield better and be more rust resistant and early maturing than the varieties previously grown. This variety is reported to be now almost the only variety of wheat cultivated, whilst the crop is increasing in popularity as a native food crop. Seed of improved varieties of pulses (cowpeas, beans, gram, etc.) and the Virginia Bunch groundnut, grown at the two sub-stations at Lupemba and Luhira, were in good demand for distribution purposes.

Estate agriculture has for the first time been developed in the Songea District. An area of 2,000 acres in the Matengo highlands has been leased to a local resident for the development of coffee growing and work has recently commenced. It is hoped that this estate will serve a useful purpose through demonstration and act as a stimulus to native coffee planting in the areas concerned. In the high-lying Malenge Plateau there is also a small amount of activity in estate agriculture.

In view of the need for condensation the reports of Circle Officers are not published, but abridged reports from the trial stations are included.

E. HARRISON,
Director of Agriculture.

ANNEXURE I.

MOROGORO AGRICULTURAL STATION.

MOROGORO DISTRICT.

The following paragraphs contain an account of the work carried out on the Morogoro Agricultural Station. In paragraph 31 of Part I of the 1929-30 Annual Report of the Department it is indicated that the continuation of the experiments on time of planting and espacement, which have been in progress for eight years now and have reached finality, would cease and the main work of the Station be in connection with plant introduction. Latterly it has been decided to reopen the experimental ranges with a view to embracing, in due course, a much wider field of investigation along such lines as it is possible to develop. This work is progressing in conjunction with the controlled introduction and trial of economic plants, suited to the climatic and soil conditions of the Station and of possible value to the Territory.

2. It will be proper to give the rainfall figures for the calendar year. The following was the monthly precipitation shown in comparison with last

year and, in the third column, the average of the five previous years, in millimetres:—

			1930 mm.		1929 mm.		Average 1924-1928 mm.
January	...	...	171.4	...	60.9	...	84.8
February	...	...	164.6	...	25.0	...	97.4
March	...	...	273.4	...	130.8	...	130.9
April	...	...	151.9	...	105.9	...	170.1
May	...	...	52.1	...	36.6	...	54.7
June	...	...	1.6	...	21.7	...	23.8
July	...	...	3.9	...	13.3	...	7.5
August	...	...	1.7	...	18.0	...	11.8
September	...	...	7.6	...	18.5	...	31.8
October	...	...	15.2	...	11.7	...	34.3
November	...	...	11.8	...	23.1	...	55.5
December	...	...	22.8	...	196.9	...	73.6
Totals :			mm. 878.0	...	662.4	...	776.2
			Inches 34.6	...	26.5	...	30.6

3. It will be seen that an abnormally wet period set in as from December, 1929, and carried through until May, 1930. The long drought that followed the end of the rains in 1930 and continued until middle February, 1931, although unfavourable to such crops as had been sown, enabled the other work of the station to proceed apace and the fields to be in a good state of cultivation by the end of the year.

4. *Furcraea fibre plant*.—In 1925, an officer (Mr. A. E. Haarer) touring in the Pare Mountains came across a few plants growing at an altitude of 4,500 feet that had the appearance of ordinary sisal with the usual blue-green colouration, but the tips of the leaves were devoid of thorns. Suckers were sent to the Morogoro Agricultural Station in January, 1926, and plants were established in the nursery. When these plants grew it was noticed that they still resembled ordinary sisal (*Agave sisalana*), for the leaves had much the same thickness, and smoothness of surfaces, without serrations along the edges, but they now differed, perhaps on account of the lower altitude, in that the leaves were noticeably longer in length and were a pale-green colour. The plants began to pole in January, 1930 (four years from planting), and it was then found that they were a species of *Furcraea*.

5. Six hundred mature leaves were cut in May, 1930, and despatched by rail from Morogoro to Kilosa, where, by the kind co-operation of the East African Sisal Plantations, Limited, they were decorticated. The report they submitted is as follows:—

Description of Spineless Fibre (Furcraea) ex-Morogoro Experiment Station.

Weight of leaves	...	...	...	...	1,346 lbs.
Number of leaves	...	...	...	...	600
Average weight of a single leaf	...	...	...	...	2.2 lbs.
Average length of leaf	...	...	...	...	52 ins.
Weight of fibre extracted	...	...	...	...	49 lbs.
Weight of fibre recovered from waste :					
(a) Entrance drum	...	...	...	...	14 lbs.
(b) Exit drum	...	...	...	...	5 lbs.
Total				...	19 lbs.

Total weight of fibre in leaves	...	...	...	68 lbs.
Percentage of total fibre contents to weight of leaves	...	...	...	5.05 per cent.
Percentage of fibre extracted to weight of leaves	...	...	...	3.64 per cent.
Percentage of waste fibre to weight of leaves	...	...	...	1.41 per cent.
Time taken to decorticate	...	...	...	5 minutes.
Decorticator	...	...	...	No. 2 Corona.

Summary :—

- (a) The leaves were decorticated five days after cutting; this accounts for the dirty colour of the fibre.
- (b) The leaves both in length and weight were better than average sisal leaf, and the butt ends were much thicker.
- (c) A total fibre content slightly over 5 per cent. compares well with sisal.
- (d) The percentage of fibre lost is high. This occurred mostly in the entrance drum and was due to the unusually thick butt ends, and could be remedied by mechanical adjustment.
- (e) The fibre is coarser than sisal fibre. In fibre content, method of treatment, extraction and output, the *Furcraea* closely resembles sisal, and, granted that the fibre is of equal value, the cultivation of this spineless species would appear to be advantageous from the point of view of planting, cultivating, rapidity of growth, yield, and cutting.

6. The fibre was despatched to the Imperial Institute in June, 1930, for report. Sacks of bulbils were distributed to each of three large sisal estates in the Territory, and the remaining material was planted in the Station nursery for propagation and further investigation. The Imperial Institute reported as follows, in September, 1930 :—

"In general appearance the material was observed to bear a strong resemblance to sisal, and in order to confirm its identity as *Furcraea* a microscopical examination of the ultimate fibres was made. These were found to resemble closely those of *Furcraea gigantea* and to be dissimilar in character to those of sisal.

"*Description.*—The sample weighed four pounds and consisted of clean, well-prepared, lustrous fibre, varying in colour from pale-cream to cream. A small amount of loose pithy matter was present in parts of the sample. The length varied from four to six feet, being mostly about five feet. The strength was rather variable, but on the whole good.

"*Results of examination.*—A representative portion of the sample was chemically examined with the following results, which are shown in comparison with the figures obtained for a typical sample of well prepared *Furcraea gigantea* fibre previously examined at the Imperial Institute :—

				Present sample		<i>Furcraea gigantea</i> fibre
				per cent.		per cent.
Expressed on the moisture-free fibre.	{	Moisture	...	...	11.3	8.1
	{	Ash	...	...	1.1	0.7
	{	(a) Hydrolysis, loss,	...	...	12.3	13.1
	{	(b) " "	...	...	16.8	15.5
	{	Water washing	...	...	2.4	1.6
	{	Cellulose	...	...	74.9	76.9

"These results show that the present fibre contained a satisfactory percentage of cellulose, and that the losses sustained on hydrolisis compared fairly well with the corresponding figures obtained at the Imperial Institute for Mauritius hemp of good average quality.

"*Commercial value.*—The fibre was submitted to a firm of merchants in London (Messrs. Wigglesworth and Co., Ltd.), who reported that it could be sold in competition with No. 1 East African sisal which was then quoted at £21 10s. per ton in the United Kingdom.

"*Remarks.*—This sample of fibre was well-prepared, and compared favourably in length and strength, and also in chemical behaviour and composition, with commercial Mauritius hemp. In general character, however, it was superior to the ordinary *Furcraea* fibre from Mauritius and more resembled sisal hemp."

7. It is proposed to determine more facts in connection with this fibre mainly in comparison with sisal.

OIL SEED.

8. *Trichodesma zeylanicum.*—This plant is a weed widespread in the Morogoro and Kilosa Districts. It springs up naturally in native grain fields following harvest, and makes most of its growth during the dry season, often forming almost pure stands. Seed ripens continuously over a long period and the optimum season for harvest would appear to be from October to November. A report appears in the *Imperial Institute Bulletin*, Vol. XXIV, No. 3, page 443, on the oil extracted from a sample of the seed submitted in 1926. The value of the seed was then estimated at £9 10s. per ton delivered in the United Kingdom, for possible use in the manufacture of cheap paint, soft soap, or when refined, as an edible oil.

9. Four hundredweights of seed were collected in 1930 and sent forward for further commercial tests with the oil, but the reports are not yet to hand.

10. *Cotton: Time of Sowing Experiment, 1930.*—In this experiment duplicate tenth-acre plots were planted at intervals of one week from 1st February to 22nd March, 1930. The planting distance was three feet by eighteen inches and two plants were left per hill. A summary of yields, together with the weekly rainfall figures for the period prior to planting, is given in the following table:—

Date of Planting	Average Plot Yields in lbs.	Yield per acre in lbs.	Comparative Yields	Weekly Rain-fall in millimetres
1st February, 1930 ...	16.25	162	100	55.8
8th " " ...	10.75	107	66	55.9
15th " " ...	6.25	62	38	5.0
22nd " " ...	8.00	80	49	48.9
1st March, 1930 ...	6.00	60	37	17.4
8th " " ...	4.25	42	26	70.2
15th " " ...	3.75	37	23	66.2
22nd " " ...	2.00	20	12	75.2

11. Below is given a summary of the results of this experiment since it was first started:—

Date of Planting	Month	Rainfall during month (mm.)											Comparative Yields				
		1924	1925	1926	1927	1928	1929	1930	1924	1925	1926	1927	1928	1929	1930		
1st February	...	261	118	46	4	57	25	165	—	—	—	67	—	44	100		
8th "	...	...	—	—	—	—	—	—	100	100	—	—	99	71	66		
15th "	...	...	—	—	—	—	—	—	—	—	—	83	100	72	38		
22nd "	...	...	—	—	—	—	—	—	82	85	83	80	88	79	49		
1st March	...	153	43	196	187	77	131	273	—	—	94	79	59	100	37		
8th "	...	—	—	—	—	—	—	—	26	62	100	100	47	86	26		
15th "	...	...	—	—	—	—	—	—	—	—	91	—	7	85	23		
22nd "	...	—	—	—	—	—	—	—	9	0	86	85	37	28	12		
29th "	...	207	61	181	191	215	106	152	—	—	83	—	—	—	—		

The result of the experiment emphasise, even more strongly this year, the necessity for planting cotton in this area as soon as possible after the start of the heavy rains in February. It is suggested that the failure of the later sowings was due to excessive rain in March and April before they were sufficiently established, whereas the earliest sowings were able to withstand the very wet conditions. Attention is drawn to the results in 1924 under similar conditions.

12. *Cotton: Variety Trial*.—A number of U/4 selections from Barberton, South Africa, are undergoing trial during the present season using the local type for comparative purposes.

13. *Multiplication of Seed*.—A function of increasing importance is the multiplication of seed to supply Tribal Farms, Demonstration Plots and other Agricultural Stations in the Territory, or for distribution to native and non-native farmers. Requests for seed from other countries are also frequently met.

14. *Plant Introductions and Trials*.—Plant Trial Farms covering one hundred and sixteen introductions of plants and seeds were received by the Station during the year. The nurseries had necessarily to be re-organised and extended. The planting of small sections of trees of either economic or educational interest in the arboretum is progressing as seedlings become available.

15. The following plants which have been planted out and established, are especially worthy of note:—

Aleurites triloba, Candle-nut. The twelve trees planted in April, 1928, are now nearly twenty feet high and beginning to fruit. The species will undoubtedly thrive well in a sandy silt with similar climatic conditions to those on the Station.

Aleurites Fordii, Tung-oil. Eighteen trees were raised and have been planted out in groups of six on three kinds of soil, i.e. sandy silt, sandy chocolate loam, red laterite loam. The growth after germination was rapid.

Hydnocarpus anthelmintica. The three-year old plants are now from four to fifteen feet high and show excellent promise of being suited to the locality. *H. Wightiana*, is also growing well but is making slower growth than the former.

Ceratonia Siliqua, Carob or Locust Bean. Attempts at transplanting have not met with success. Several plants have been allowed to remain and develop in the nursery. They appear healthy and in two years have grown to eight and ten feet in height and commenced flowering.

Coffea excelsa. Twenty-four plants were planted out in April, 1930, towards the end of the rains. Although growth was not rapid, they withstood the dry weather of 1930 excellently and with the recent rains have grown apace. This coffee appears quite well suited to the richer soils of the locality. *C. robusta* failed with the drought, and it appears that the conditions in Morogoro are entirely unsuited to this species. *C. Arabica* usually merely struggles to exist and any attempt to grow these last two species has been abandoned.

Virgilia capensis. A slender tree with handsome mauve flowers, that may be useful as a shade plant for coffee, has been planted out and established in the arboretum.

Citrus fruit. A number of good varieties of citrus fruits, including the grape fruit, have been established and a limited amount of budwood from them is available for propagation.

Mango. The varieties of this most useful fruit tree, although numerous in the Territory, are on the whole inferior in the quality of the fruit. The famous variety Caraboa has been introduced from the Philippines and should be particularly useful for distribution to natives, as it is one of the few really good varieties said to reproduce true to type from seed.

A. E. HAARER,
for District Agricultural Officer.

ANNEXURE II.

IBADAKULI AGRICULTURAL STATION.

SHINYANGA DISTRICT.

The majority of the experiments outlined in the succeeding paragraphs of this report have been in the progress at Ibadakuli over a period of years and the data for 1930 thus adds to the value of the results hitherto obtained, which also form a basis for comparison.

2. Efforts have been directed in the main towards the means of improving the standard of agriculture by the investigation of the chief crops of the Tabora-Mwanza area in regard to their behaviour under various spacings, times of planting, manuring and cultivation. In addition to these experiments, variety trials of imported selected sorghums, millets, groundnuts, maize and fodder crops have been conducted, whilst wind erosion has been checked by the planting of wind-break crops round the more exposed boundaries of the farm.

3. *Meteorological*.—The favourable seasonal distribution of the rainfall ensured good growing conditions although the total precipitation was below the average. The monthly rainfall for the growing season (November, 1929 to June, 1930) was as follows:—

November	...	...	44.0 mm.	March	...	...	...	182.0 mm.
December	...	...	170.6 "	April	...	...	...	110.2 "
January...	...	...	53.2 "	May	...	...	...	26.6 "
February	...	...	144.0 "	June	...	...	...	7.8 "

The total rainfall for 1929 and 1930 was 471.4 millimetres or 18.7 inches and 788.0 millimetres or 31 inches, respectively.

4. *Pests and Diseases*.—The chief factor to interfere with the recording of results of true experimental value has been the extremely high incidence of termite attack. The amount of damage attributed to this pest would appear to be increasing yearly, possibly due to the increase of the humus content in the soil through the application of farm-yard manure. Frequent stirring of the surface soil by inter-row cultivation has the effect of restricting their activities, but affords no real solution to the problem.

5. The cotton plots suffered extensive damage during the initial bolling period from the Egyptian boll-worm, which caused the loss of a high percentage of the earlier bolls. Later an epidemic of field mice appeared towards the end of the season and caused appreciable damage to seed-cotton by eating the seed.

6. The grain crops, particularly the later planted maize and Sudan grass, were considerably damaged by the stalk borer caterpillar; aphids were troublesome at intervals throughout the season.

7. Although the eradication of witch seed (*Striga* spp., parasitic on the roots of graminiferous crops) has received much attention during the past few years, the attack was again sufficiently severe to be troublesome. Apart from trap-cropping with such crops as sorghum or Sudan grass, which, although useful, is not always feasible, cultivation combined with hand-picking are the only effective remedial measures.

8. *Buildings.*—The Native Administration have provided a commodious seed store, part of which has been allotted for use by this Department in exchange for all revenue from produce grown on the experimental station. Other improvements such as a cement threshing floor, a concrete silo, cow byres, a dairy and a pig sty are contemplated. If funds are available during the next financial year, it is hoped to erect labour lines and replace the existing mud and grass huts used by the Native Instructors with buildings of cement and corrugated iron.

9. *Method of Laying down Experiments.*—The experimental area was ploughed, cross ploughed and harrowed. A moderate dressing (about four tons per acre) of well-rotted farmyard manure was applied as uniformly as possible to all the manured plots. In all experiments one-fortieth acre plots were used and each treatment replicated four times.

10. *Maize: Time of Sowing Experiment.*—In this experiment two varieties of maize (Potchefstroom Pearl and White Congo) were used and the plots planted at fortnightly intervals; the planting distance was three feet by two feet. A summary of the yields is given in the following table:—

Date of Planting				Yield in lbs. per acre			
				Potchefstroom Pearl		White Congo	
				Manured	Unmanured	Manured	Unmanured
13th December, 1929...	...	...	...	1,850	1,380	430	160
27th " " " " " "	...	...	...	2,340	2,040	660	460
10th January, 1930	...	...	...	2,270	2,080	990	710
24th " " " " " "	...	...	...	2,520	2,550	1,300	940
7th February, 1930	...	...	...	1,530	1,590	920	760
21st " " " " " "	...	...	...	660	900	670	420
7th March, 1930	...	...	...	450	720	460	610
21st " " " " " "	...	...	...	205	190	180	90

11. As with the previous results of this experiment, the optimum planting dates fall within the period from the latter part of December to the end of the third week in January, which may safely be regarded as the most suitable time to plant maize in a normal season.

12. Potchefstroom Pearl maize again demonstrated its superiority in yielding ability as compared with White Congo maize, if average rainfall conditions for the area are experienced, although the differences this year are unusually great: the later plantings, however, indicate to some extent the drought-resisting capacity of White Congo maize.

13. Substantial increases in yield, due to application of farmyard manure, were usual in the early plantings only. This is possibly due to lack of moisture being the limiting factor in growth in the later plantings. The statistical treatment of the yields obtained from the complete series of White Congo plots, manured and unmanured, reveals significant increase in yield due to manuring in the early plantings only, but not on the complete series.

14. *Spacing Experiment with Maize.*—Both Potchefstroom Pearl and White Congo maize were again used. The planting was carried out on the 11th and 12th December, 1929, and the following results obtained:—

Spacing	Yield in lbs. per acre			
	White Congo		Potchefstroom Pearl	
	Manured	Unmanured	Manured	Unmanured
3ft. × 2ft.	690	650	890	890
3ft. × 3ft.	1,070	600	980	1,150
4ft. × 1ft.	770	500	720	970
4ft. × 1½ft.	1,040	630	960	1,250
3½ft. × 1ft.	830	390	940	1,000

No definite conclusions can as yet be drawn, as in both the previous two years the maximum yield in this experiment was obtained with a spacing of four feet by one foot. One would expect the closer spacings to give the best yields in good years and the wider spacings in the drier seasons.

15. *Sorghums and Millets: Variety Trials.*—

Variety	Days to Maturity	Yield in lbs. per acre		Comparative yield based on unmanured plots
		Manured	Unmanured	
Kilinyali	176	1,135	780	100
Gassabys "	114	720	715	91·6
Feterita	119	965	685	87·8
Bulrush Millet	152	470	465	59·6
<i>Panicum frumentaceum</i>	103	235	285	36·5
Early Sumac	134	—	275	35·2
Sudan Grass	110	260	240	30·8
White Hegari	126	—	185	23·7
Red Amber	138	—	170	21·8
White Milo	134	—	80	10·3
Proso Millet	76	120	60	7·7
Black Amber	131	—	42·5	5·4

16. As in previous years Kilinyali again gave the best yield, whilst the early maturing Sudan types Gassabys and Feterita also gave good results; as they mature in a much shorter time than the local types, they should

prove useful introductions into the native agriculture of the area. The use of farmyard manure again appeared to be warranted only in the case of the high yielding types.

17. *Sudan Grass Hay*.—The following yields of hay were obtained from Sudan grass, considerably higher yields being harvested from the manured plots as expected :—

					Yield of Dry Hay, lbs. per acre	
					Manured	Unmanured
First cutting ...	...	...	...	...	1,780	1,350
Second „ ...	...	...	...	...	1,220	640
Total ...					3,000	1,990

18. *Groundnuts : Time of Sowing Experiment*.—The spacing kept was thirty inches by nine inches and the plots were planted at fortnightly intervals, the variety Virginia Bunch being used :—

Date of Planting		Days to Maturity		Yield in lbs. per acre of unshelled nuts	
				Manured	Unmanured
13th December, 1929	...	112	...	3,080	3,020
27th „ „	...	99	...	2,980	3,330
10th January, 1930	...	89	...	1,640	1,680
24th „ „	...	76	...	1,120	1,610
7th February, 1930	...	81	...	1,440	1,050
21st „ „	...	94	...	440	490
7th March, 1930	...	80	...	490	550

The previous years' results, as well as the above, definitely indicate that early planting, immediately the rains have set in, gives the maximum yield. This crop does not appear to benefit from applications of farmyard manure, although a visible increase in the amount of the foliage was observed as the result of the treatment.

19. *Groundnuts : Spacing Experiment*.—Two series of plots were planted for each spacing, all plots being planted on 11th December, 1929, and harvested on 2nd and 3rd April, 1930 :—

					Yield in lbs. per acre of unshelled nuts	
					Manured	Unmanured
30ins. × 9ins.	...	...	...	First Series	2,860	2,810
	...	...	...	Second Series	2,430	2,860
	...	...	...	Average	2,645	2,835
36ins. × 9ins.	...	...	...	First Series	2,150	2,660
	...	...	...	Second Series	2,020	2,310
	...	...	...	Average	2,085	2,485

The closer spacings produced greater yields and would indicate that a wider range of closer spacings should be tried.

20. *Indian Groundnut*.—A series of plots of a newly introduced variety from India were planted. This variety took thirty to forty days longer than the Virginia Bunch to mature, and curiously enough, appeared to respond

to manuring. The yield of shelled nuts will be low in proportion to that of the unshelled as many of the shells contain decayed nuts, possibly due to the variety being unacclimatized as yet.

			Yield in lbs. per acre of unshelled nuts	
			Manured	Unmanured
3ft. × 1ft. 6ins.	...	...	1,690	990

21. *Pulses : Variety Trials.*—

			Days to Maturity	Yield in lbs. per acre	Comparative Yield
Mat Bean	...	...	81	1,050	10.0
Pink Hopi Bean	...	...	210	240	22.9
Canadian Wonder	...	...	71	240	22.9
Black Gram	...	...	124	240	22.9
Soya Bean	...	...	79	130	12.0
Brown Hopi	...	...	158	70	6.7
Large Seeded Gram	...	...	106	Too small to record.	
Field Peas	...	...	Failed.		

The introduced Mat bean, *Phaseolus aconitifolius*, again demonstrated its ability to produce heavy yields under the conditions and promises to be a useful drought resisting food crop.

22. *Cotton : Time of Sowing.* As in previous years the spacing in this experiment was three feet by eighteen inches :—

			Lbs. of seed-cotton per acre	
			Manured	Unmanured
15th November, 1929	...	...	220	235
29th " "	...	...	330	360
13th December, 1929	...	...	340	205
27th " "	...	...	240	80
10th January, 1930	...	...	155	65
24th " "	...	...	120	50
7th February, 1930	...	...	105	50
21st " "	...	...	20	25
7th March, 1930	...	...	22	30
21st " "	...	...	20	25

Termite damage interfered seriously with the stands in certain of the plots in this experiment and definite conclusions in regard to the manuring cannot be drawn. Observations made over a period of five years now, however, have definitely established the optimum time for planting cotton in this area to be during the month of December, coinciding in a normal season with the commencement of the main rains.

23. *Cotton : U/4 Selections.*—The original selections of U/4 cotton seed, introduced to this Territory by the writer as the outcome of a duty visit to the cotton breeding station at Barberton, Transvaal, South Africa, consisted of the following :—

- 6 lb. U/4/4 cotton seed;
- 3 lb. U/4/4/2 seed-cotton;
- one single selfed boll from a selected U/4/4/2 plant.

In addition, 50 lbs. U/4 cotton seed were subsequently purchased by the Department to furnish material for more extensive trials in the Tabora-Mwanza Districts.

24. The U/4 strains have been evolved under conditions of low rainfall and low minimum temperatures, are highly resistant to jassid, early maturing, drought resisting and prolific yielders (yields of 2,000 lbs. per acre were common in South Africa), whilst the excellent scaffolding of the plants provides the greatest possible margin between leaf stalk and stem to seed-cotton.

25. Unfortunately planting was late and unavoidable delays occurred on account of the Experiment Station at Ibadakuli being cut off from Shinyanga by the flooded river.

26. The U/4/4/2 and U/4/4 selections were planted on the 6th February, followed by the U/4 seed on the 7th. The U/4/4/2 seed was defuzzed immediately before planting with acid. After planting a hot, dry, practically rainless period set in until the 26th when the precipitation was 29.4 millimetres. As the most rigid economy of the seed was exercised, planting only two and three seeds per hole, the effect of the drought combined with the ravages of white ants adversely affected germination and resulted in a very poor stand being obtained. Abnormal rains followed, producing a vigorous growth of succulent leaves, stalks and stems, thus rendering the plants an easy prey to insects, which appeared at the following stage and caused a high percentage of bud and boll shedding as the season progressed.

27. With the advent of drier conditions healthy bolls were formed and the highest pickings were recorded between the 8th of July and 22nd of August.

28. The table which follows shows the various yields obtained, but these can merely be regarded as indicative in view of the poor stands obtained and the fact that only one plot of each was planted.

Type	Area	Planting date	Total picked	Seed obtained	Ginning out-turn
U/4/4/2 ...	1/5 acre	6th February, 1930	50½ lbs.	31½ lbs.	37%
U/4/4 ...	1 "	6th " "	371½ "	247 "	33%
U/4 ...	2 "	7th " "	197½ "	129½ "	34%

One acre of U/4 cotton was also planted at Lubaga, Shinyanga District, under superior soil conditions and yielded 412 lbs. per acre; the plot was uprooted and burned whilst still bearing profusely.

29. The yields given in the above table, although generally speaking much higher than the average district yields, cannot be regarded as being of much experimental value. Conclusions that the U/4 types are indefinitely superior to the existing type are based purely on a careful study of individual plants. It was unfortunate that the absence of the writer on home leave prevented a closer study of these trials during the greater part of the growing season.

30. One ton of U/4/4/2 seed was obtained from the Cotton Breeding Station at Barberton, South Africa, for the 1931 season.

H. MARSLAND,
District Agricultural Officer.

ANNEXURE III.

MPANGANYA AGRICULTURAL STATION.

RUFJI DISTRICT.

The year under review was notable for an unduly high rainfall, the monthly precipitation being as follows:—

1930	mm.	Average of Eight Years (in mm.)
January	125.7	132.9
February	250.8	70.8
March	321.8	170.9
April	140.4	248.8
May	6.6	56.6
June	Nil	0.7
July	8.4	3.1
August	2.5	5.9
September	63.1	12.4
October	0.5	24.8
November	31.8	65.4
December	43.7	69.6
Total	995.3	861.9
	39.2 inches	34.4 inches

Owing to the unusual floods experienced in the early part of the year, all experiments on section B of the Station, representing the lowland soils of the district, were destroyed.

These include:—

Rice Variety Trials.

Rice Multiplication Plots.

Time of Sowing of Cotton Experiment.

Distance of Planting of Cotton Experiment.

Groundnut Variety Trials.

2. *Cotton: Time of Sowing.*—This experiment, a continuation from previous years, was carried out in duplicate one-fortieth acre plots sown at fortnightly intervals, the plants being thinned out to two per hill:—

Plot Number	Date of Sowing	Monthly Rainfall	Average yield per plot	Comparative yield	
	1930.	mm.	kgs.		
1	8th January	January	125.7	13.5	II. (99)
2	22nd „	February... ..	250.8	13.7	I. (100)
3	5th February	March	321.8	7.2	VIII. (53)
4	19th „	April	140.4	12.7	III. (93)
5	5th March	May	6.6	12.0	IV. (88)
6	19th „	June	—	6.0	IX. (44)
7	2nd April	July	8.4	11.0	V. (80)
8	16th „	August	2.5	8.0	VII. (58)
9	30th „	September	63.1	11.0	V. (80)
10	14th May	October	0.5	8.2	VI. (60)

The result indicates the benefit to be obtained by early sowing, the highest yields being procured from plots sown during the month of January. In the experiment no replantings were made.

3. Comparison with results of previous years.—

Optimum Date of Sowing					Yield of Seed-Cotton per acre lbs.
1925 ...	...	...	...	3rd March	1,136
1926 ...	...	...	...	5th February	812
1927 ...	...	...	...	22nd January	692
1928 ...	...	...	...	9th "	422
1929 ...	...	...	...	22nd "	260
1930 ...	...	...	...	22nd "	1,096

These results obtained over a considerable number of years bear out the fact that cotton should be sown so that flowering takes place immediately after the long rains. In this way not only is the highest yield obtained, but also the highest proportion of first grade seed-cotton. Insect and fungal attack were very slight on all early sown cotton.

4. *Cotton: Distance of Planting.*—As in previous years, duplicate one-fortieth acre plots of cotton were sown at different spacings. The plants were reduced to two per hill in each plot:—

Plot number	Spacing	Comparative yield
1 ...	3ft. × 6ins.	48
2 ...	3ft. × 9ins.	73
3 ...	3ft. × 1ft.	100
4 ...	3ft. × 1½ ft.	78
5 ...	3ft. × 2ft.	97
6 ...	3ft. × 2½ ft.	45

This result obtained on the uneven soil of section A of the Agricultural Station, and in the absence of a lay-out sufficiently accurate for statistical purposes, indicates an optimum spacing in the region of three feet by twelve inches to three feet by twenty-four inches. This has been supported by figures of yields in seed multiplication plots of cotton, in which a spacing of three feet by eighteen inches has given the highest yields consistently.

5. *Cotton: Variety Trials and Cotton Selections.*—A number of selections were made from each variety of cotton grown on the Agricultural Station. These plants, the flowers of which were selfed, were selected on earliness, habit, freedom from disease and yield. The following are the selections with yields in grams per plant; the variations in yield per plant; the variations in yield per plant over the entire plots are included for purposes of comparisons:—

Variety	Selection number	Yield (in grams)	Variation in Plant Yield per plot (in grams)
R.M. 68 ...	1	110.0	18.2-169.5
" ...	2	106.0	
" ...	3	88.5	
Uganda 17 ...	1	164.5	20.6-394.6
" ...	2	137.2	
" ...	3	260.2	
Webber ...	1	76.8	11.2-115.0
" ...	2	103.4	
S.G. 27 ...	1	206.7	160.3-380.1
" ...	2	283.5	
S.G. 29 ...	1	287.6	187.5-301.4
" ...	2	217.3	

The yields of these selected plants are generally low compared with the maximum yield over the whole plot. This is accounted for by the heavy boll shedding induced by the process of selling. The yields of individual plants are high in varieties S.G. 27 and S.G. 29; in both of these germination was very poor and even with the aid of resowings a very poor stand was obtained. The exceptionally wide spacing thus produced promoted vigorous growth and consequent heavy yield. These plants together with selections from the Mp strains were subjected to the usual laboratory tests in order to obtain suitable selections from each variety. The results appear in paragraph 7.

6. *Mp Selections.*—The Mp selections, made by Mr. R. C. Wood of the Empire Cotton Growing Corporation from ordinary district cotton, were continued for further trial and selection. Uniformity as regards habit of growth and period of maturity was lacking in all, while in one selection—Mp 9/2—incidence of disease was extremely high. Selection Mp 13/3 has given very poor germination for a number of years, the germination being sufficiently poor to warrant its elimination from further trial had it not given consistently good results in laboratory tests; it has therefore been retained with the hope of possible improvement in seed vigour before multiplication on a large scale :—

Selection				Weight of 100 Seeds + Lint (in grams)	Weight of 100 seeds (in grams)	Lint index	Ginning percentage	Lint Length (in inches)
Mp 9/3	...	...	...	16.60	11.60	5.00	30.1	1½
Mp 9/2/1	...	...	...	15.10	10.30	4.80	31.8	1-1/16
Mp 19/1	...	...	...	14.60	10.10	4.50	27.1	1-3/16
Mp 13/3	...	...	...	10.85	7.35	3.50	32.3	1-3/16
Mp 8/1	...	...	...	12.05	8.20	3.85	31.9	1¼
Mp 4/2	...	...	...	10.00	7.15	2.85	28.5	1-3/16
Mp 12	...	...	...	13.85	9.05	4.80	34.6	1-1/16
Mp 19	...	...	...	14.35	10.15	4.20	22.3	1½

7. Selections and other varieties grown on the Agricultural Station were subjected to similar tests :—

Selection				Weight of 100 Seeds + Lint (in grams)	Weight of 100 seeds (in grams)	Lint index	Ginning percentage	Lint Length (in inches)
R.M. 68/1	...	...	...	15.10	10.40	4.70	31.1	1½
Uganda 17/2	...	...	...	12.75	8.65	4.10	32.2	1
R.M. 53/3	...	...	...	15.85	11.50	4.35	26.7	1-1/16
Webber	...	...	...	16.80	11.80	5.00	29.7	1-1/16
S.G. 27	...	...	...	14.85	9.90	4.95	33.3	1½
S.G. 29	...	...	...	15.50	10.90	4.60	29.7	1-1/16

The examination of all varieties of cotton grown on the Station showed a very marked lack of uniformity. This variation was most marked in vegetative habit, flowering and fruiting characteristics and period of maturity, and the single plant selections have been made with a view to limiting the range of this variation. The quality of several of the Mp selections notwithstanding this lack of uniformity was very notable.

8. *Entomological and Mycological*.—Diseases present on the experimental plots of cotton and their percentage incidence were :—

Variety	Angular Leaf Spot (<i>Bacterium malvacearum</i>)	Internal Boll Rot (<i>Nemato-spora gossypii</i>)	Rust on Leaves (<i>Kuehneola gossypii</i>)
R.M. 53	2	—	—
Uganda 17	100	50	1
R.M. 68	1	1	9
Mp 9	2	75	—
Mp 9/2	33	60	20
Mp 19	—	30	10
Mp 8/1	15	20	4
Mp 4 2	—	—	15
Mp 13/3	—	1	9
Mp 12	—	5	5
S.G. 27	—	—	2
S.G. 29	—	—	5
Webber...	—	5	5

Counts on Angular Leaf Spot and Rust are per plant, those on Internal Boll Rot on plots.

Cotton stainers were present in unusually high numbers, while bollworms (chiefly Pink Bollworm) made late pickings of cotton unprofitable.

9. *Cotton Multiplication Plots*.—A one-acre plot of Webber cotton, subdivided into four equal plots, each bounded by a border row to eliminate margin effect, gave the following yields :—

Plot A.	Plot B.	Plot C.	Plot D.	Total.
24½ kgs.	42 kgs.	19½ kgs.	18 kgs.	104 kgs.

The variation and the low average yield are due to unevenness of soil. This variety, however, gave a very high percentage germination and rapid growth.

The two selections S.G. 27 and S.G. 29 from Serere, Uganda, gave extremely low germination, and, in spite of resowings, a very poor stand. Both varieties resembled Uganda 17 (and to a lesser extent the ordinary district cotton) in their rank vegetative growth. With acclimatised and vigorous seed better results can be expected.

10. *Indigenous Sorghums*.—The collection of native sorghums was increased in order to make a comprehensive study of the crop and if possible to select superior varieties. Three varieties from inland areas were included in the trials for purposes of comparison. All were sown in mid-January and harvested in June :—

Variety	Number of days to flowering	Number of days to Harvest	Comparative Yield
Bonganhilo	88	143	38
Kilinyali	97	157	44
Suksha	90	157	51
Jebere	99	154	66
Nganena	100	151	50
Msigara	98	154	82
Nokore	99	154	87
Msumbiji	99	153	69
Sungura	98	155	68
Karaza	96	155	84

Variety				Number of days to flowering				Number of days to Harvest				Comparative Yield
Kibwe	...	...	...	98	...	...	...	156	...	...	...	83
Kanga	...	...	...	98	...	...	...	156	...	...	...	68
Ndunyungu	...	...	...	99	...	...	...	155	...	...	...	51
Mbangara	...	...	...	103	...	...	...	158	...	...	...	98
Libutuka	...	...	...	101	...	...	...	158	...	...	...	100
Mbawara	...	...	...	101	...	...	...	158	...	...	...	47
Ndongoro	...	...	...	98	...	...	...	158	...	...	...	39
Kigumi	...	...	...	98	...	...	...	158	...	...	...	88
Mgana	...	...	...	103	...	...	...	158	...	...	...	65
Topeka	...	...	...	101	...	...	...	158	...	...	...	77
Msinganga	...	...	...	98	...	...	...	158	...	...	...	88

The only outstanding defect of local types of sorghum was found to be the long maturity period required, and although many varieties from the interior are superior in this respect, few of them can replace local types on account of their poor keeping qualities in the damp coastal area. Both Kilinyali and Bonganhilo deteriorate rapidly in storage, while Sukesha is a considerable improvement and is already very popular with natives. Of local types, Sungura, a soft, white-seeded variety appears to be the most suitable for early consumption, while Nganena, a hard, small-seeded variety, is widely grown as a late maturing millet suitable for storage.

11. *Introduced Sorghums*.—Trials of introduced sorghums were continued. The varieties were sown in one-fortieth acre plots towards the end of the long rains in order to ensure flowering and fruiting within the dry season :—

Variety				Number of days to Flowering				Number of days to Harvest				Plot Yield (in lbs.)				Height at Harvest (in feet)
Feterita	...	...	...	51	...	...	...	81	...	...	...	3	...	...	...	5
Red Amber	...	...	...	46	...	...	...	85	...	...	...	8	...	...	...	7½
Red Leoti	...	...	...	44	...	...	...	80	...	...	...	4	...	...	...	5½
Dwarf Hegari	...	...	...	37	...	...	...	60	...	...	...	1	...	...	...	5

The maturity period of these introduced sorghums is relatively half that of indigenous varieties, the only desirable quality they have shown. The yields of all varieties are low, and the soft grain is badly suited for native methods of seed storage.

12. *Bulrush Millets*.—Bulrush millets both indigenous and from inland parts were sown in duplicate one-fortieth acre plots in January and harvested in June. The average comparative yields of the plots are :—

Variety				Number of days to Flowering				Number of days to Harvest				Comparative Yield
Dodoma	...	...	...	66	...	...	...	130	...	...	...	64
Tabora	...	...	...	64	...	...	...	128	...	...	...	56
Nyamihuki	...	...	...	70	...	...	...	140	...	...	...	64
Ruhonyo	...	...	...	70	...	...	...	141	...	...	...	76
Nyamitoti	...	...	...	62	...	...	...	141	...	...	...	88
Lumbururu	...	...	...	62	...	...	...	141	...	...	...	100
Kukwili	...	...	...	66	...	...	...	142	...	...	...	80
Kisogo	...	...	...	64	...	...	...	142	...	...	...	52
Mkula	...	...	...	62	...	...	...	131	...	...	...	76

Both Dodoma and Tabora varieties obtained from inland areas are earlier than local types and superior in the keeping qualities of the grain. Of native-grown varieties Mkula is the most popular. Both Dodoma and Tabora varieties have been distributed to native cultivators as widely as possible and are becoming very popular.

13. *Trials of Cow peas*.—Six varieties of cow peas from South Africa were sown on 2nd April, 1930, in single rows thirty yards long. Six local varieties were sown in adjacent rows for comparison. The following are the yields of seed obtained :—

Arlington (South Africa)	...	...	...	...	...	Nil
Catjang	"	...	...	...	...	"
New Era	"	...	...	...	...	"
Groit	"	...	...	...	...	"
Black	"	...	...	...	...	$\frac{1}{4}$ lb.
Brabham	"	...	...	...	...	5 lbs.
Karasa (local)	...	...	...	...	...	8 "
Ngowa "	...	...	...	...	...	$10\frac{1}{4}$ "
Mnyamkwili (local)	...	...	...	...	...	8 "
Red	"	...	...	...	...	Nil
Bonongwa	"	...	...	...	...	5 lbs.
Kipara	"	...	...	...	...	$3\frac{1}{2}$ "

Varieties Arlington and Catjang were stated to be of "bush" type, New Era, Groit, Black and Brabham of "half-bush" type. In the experiment all varieties were found to be procumbent, none approaching a "bush" or "half-bush" type. All varieties, local and introduced, developed a stem gall, the stems becoming enlarged until about three to four inches in diameter. Stem gall is fairly common in native plantations throughout the district but does not seriously impair the vigour of the plants. This was borne out in the varietal test—all indigenous varieties being affected but slightly while introduced varieties (with the exception of Brabham) were severely attacked. The weakened vitality of the plants induced premature flowering and few pods were formed.

14. *Cover Crops*.—Trials of various cover crops were made for comparison of cover effect. Particular note has been made of rapid germination, as without this characteristic weeds are apt to gain an initial advantage which cannot be easily overcome by the cover crop. The crops tested and their cover effect in relative order is :—

Cover Crop	Relative Cover Effect
Bonavist bean	I.
<i>Passiflora foetida</i>	II.
Velvet bean	III.
Cow peas	IV.
Gram	V.
Tepary bean	VI.

Bonavist bean (*Dolichos lablab*) has proved to be the most efficient cover crop for combating weeds. Germination is rapid and very even and the legume quickly smothers out weed growth. If sown at the beginning of the rains the crop maintains an excellent cover through the dry season and regenerates sufficiently during the short rains to provide a quantity of green material for digging into the soil. The beans are used as food especially during the times of shortage.

Passiflora foetida, a non-leguminous cover crop, has proved its suitability for controlling weed growth in plantations. An area on the Agricultural Station planted up with coconuts and ornamental trees has been kept entirely free of weeds by this crop, which regenerates every year on the advent of the rains. It has only a very slight tendency to climb and should be of great value in preventing soil erosion in permanent-crop plantations.

Velvet beans, on account of rapid germination and growth in the initial stages, provide an effective cover. The crop is particularly suitable for sowing with maize when the latter is harvested, while it is also valuable as cattle food. It is a strong climber and therefore useless for sowing with permanent crops.

Cow peas and Gram are widely used by natives as food crops and have only a limited value for suppressing weeds.

Tepary bean has given unsatisfactory results both as cover crop and food legume. Germination is poor and growth uneven.

J. ROBERTSON,
District Agricultural Officer.

ANNEXURE IV.

MPAPURA AGRICULTURAL STATION.

MIKINDANI DISTRICT.

The station is situated in the Mambi Valley at approximately two hundred feet above sea-level, the farm is intersected by the main Lindi-Mikindani road and is eighteen miles from Mikindani and forty-seven miles from Lindi.

2. Work on the Station commenced in May, 1929, in which year most of the building work was completed and about fifty acres of land cleared for cultivation. This area was planted up in 1930, half of it being measured out as experimental plots.

3. The experimental planting detailed below were in the main designed to clean the land, show up irregularities in soil and to give a general idea of the suitability of the various sites for experimental work with the different crops. Definite results of crop trials were of secondary importance under the circumstances.

4. *Rainfall*.—The rainfall (in millimetres) during 1930 was as follows :—

	Mm.		Mm.
January ...	263·0	Brought forward	845·0
February ...	101·0	August ...	6·4
March ...	403·4	September...	27·6
April ...	51·5	October ...	92·1
May ...	26·1	November...	41·5
June ...	nil	December ...	28·9
July ...	nil		

Carried forward 845·0

Total ... 1,041·5 mm.
or 40 ins.

5. The unusually heavy rains resulted in many parts of the cultivated area being frequently under water for several days. Although marring the experimental work to a large extent, such flooding had given an early knowledge of what in future may be expected on certain parts of the station and in this way is a useful guide in the selection of land for crop trial purposes.

6. *Cotton: Time of Planting Trials.*—The trial was originally planned so that three or four replicates could be planted at intervals of a week. This was rendered impossible owing to frequent and prolonged floodings. Consequently the averages given in the table below are computed in many cases from only two replicates. Plot observations, which took into account the character of the soil and conformation of the plots, tended to show that the January plantings enjoyed an unfair advantage. Water-logging also exerted a grave influence on certain plots, so that on the whole, although the figures are generally indicative, they are by no means strictly reliable.

7. The plots were each one-tenth of an acre, the planting distance was three feet by one-and-a-half feet and the plants were thinned out by hand to two per hill. The total rainfall for the week preceding planting is incorporated in the table of results which follows:—

Date of planting				Number of Replicates	Average Yield of Seed-Cotton per plot	Comparative Yield	Weekly Rainfall
					Lbs.		Mm.
1st January	...	...	...	2	48	100	93.0
8th "	...	...	...	2	31	65	81.0
15th "	...	...	...	2	28	58	33.0
22nd "	...	...	...	2	6	13	nil
29th "	...	...	...	6	23	48	112.0
6th February	...	...	...	8	22	46	44.0
12th "	...	...	...	7	17	35	19.5
19th "	...	...	...	5	13	27	10.0
26th "	...	...	...	4	12	25	38.5
6th March	...	...	...	2	13	27	79.2
13th "	...	...	...	4	19	40	122.6
20th "	...	...	...	3	10	21	149.8
27th "	...	...	...	1	12	25	42.5
3rd April	...	...	...	6	11	23	58.5
10th "	...	...	...	2	6	13	8.3
17th "	...	...	...	2	8	17	11.9
24th "	...	...	...	2	9	18	10.1

8. *Sorghum: Variety Trials.*—Eight varieties were planted in duplicate one-tenth acre plots, at a spacing of three feet by one-and-a-half feet. The trial was planted on 23rd December but the young plants were completely destroyed by an invasion of "Army Worm" and the crop was replanted on 11th January. The yield were as follows:—

Variety	Yield in lbs. per acre	Variety	Yield in lbs. per acre
Kilinyali...	470	Lukukutu ...	130
Sukesha ...	450	Msukula...	650
Bonganhilo ...	140	Gassabi ...	5
Ludede ...	990	Feterita ...	15

9. The first three varieties were originally Shinyanga varieties, multiplied at Morogoro, whence the seed was obtained. The second three varieties are local and the last two are from the Sudan.

10. Both Bonganhilo and Lukukutu gave poor stands owing to faulty germination. This applies also to a much greater extent to Gassabi and

Feterita, which in addition made very poor growth. The heads of the latter two varieties were mouldy and insect-infested at harvest time. The best quality grain was that from Sukesha. It was clean and white and its keeping quality seemed to be little inferior to that of the local varieties. Kilinyali came second in this respect. All three local strains were severely infected by smut and gave dirty samples of grain. Bonganhilo gave a clean sample of grain which deteriorated and became weevil-infested very quickly. Ludede is the variety of sorghum most commonly grown in the coastal districts.

11. *Rice: Variety Trial.*—This trial was laid down on 27th December but owing to the invasion of "Army Worm" was replanted on 15th January. The planting distance was one foot by one foot and the plots were each one-tenth of an acre. Only six of the varieties were planted in duplicate, the remaining eight being represented by single plots. The percentage stand given in the table below was obtained by estimation and not by counting, so is only approximate. The results were as follows:—

Variety	Percentage Stand	Yield per plot in lbs.
Sifara (L)	45	97
Pakapaka (M)	80	88
Unyengwa (R)	65	73
Karafuu (M)	55	69
Faya (M)	87	67
Afa (L)	80	62
Likoti (L)	70	62
Ngwindimba (L)	90	54
Bungala (L)	20	49
Mwanga (R)	40	47
Afiri (R)	50	34
Gandamoja (L)	60	30
Themanini (R)	70	20
Komamanga (R)	5	3

The letters in parenthesis indicate the origin of the seed thus: L=Local
M=Morogoro and R=Rufiji

12. The above results, together with field observations, strongly indicate that several of the local varieties are varieties in name only. The work being carried out at Mpanganya with rices is being made use of in an attempt to establish the identity of the different varieties here. Until this is done wholly satisfactory progress cannot be attained.

13. It is worth noting that Unyengwa, a promising hill variety from Rufiji, took third place in the list of yields.

14. *Sorghum Multiplication.*—Three blocks, each of five acres, were sown with Kilinyali, Sukesha and Bonganhilo sorghums. As these represent three of the experimental varieties under true field conditions, it is interesting to note that the yields agree to some extent with those obtained in the experimental plots. The yields per acre of the three varieties were:—

Kilinyali...	...	...	...	...	621 lbs.
Sukesha ...	...	...	...	...	698 „
Bonganhilo	...	...	...	...	121 „

15. *Other Trials.*—Three other trials with Maize, Lima Abundance beans and sorghum were complete failures owing to water-logging.

16. *Seed Multiplication*.—The following seed was harvested from plots other than those under experiments :—

Simsim	...	...	...	...	...	188 lbs.
Kilinyali Sorghum	...	...	...	...	...	3,108 "
Bonganhilo	"	...	...	...	...	605 "
Sukosha	"	...	...	...	...	3,488 "

17. *Orchard*.—A new site has been selected for an orchard. This has been cleaned and planted up with annual crops, in order to bring it into suitable condition.

R. D. LINTON,
District Agricultural Officer.

ANNEXURE V.

REPORT OF THE ENTOMOLOGIST.

Staff.—The Entomologist proceeded on vacation leave from the locust field of the Northern Province on the 4th May and returned to the Territory on the 22nd December, 1930. During his absence the Assistant Entomologist officiated and a report of his activities appears in Annexure VI. Mr. Sohan Singh Bindra, formerly Assistant Cotton Entomologist in the Department of Agriculture, Punjab, entered on his duties at the Entomological Laboratory on 24th September.

2. *Activities on Leave*.—The Entomologist, as official delegate of the Territory, attended the following conferences :—The Third Imperial Entomological Conference; the Ninth International Horticultural Conference; the First Imperial Horticultural Conference in London; the Empire Cotton Growing Corporation's Conference on Cotton Growing Problems at the Shirley Institute, Didsbury. He also attended a conference arranged by the Ministry of Agriculture on "Weather and Insect Pests" at the Meteorological Office, London, and the Imperial Fruit Show at Leicester. Visits were paid to various manufacturers of spraying apparatus for the purpose of studying suitability of existing models and/or their improvement for local coffee growing conditions.

3. *Recent Activities*.—During the period since his return from leave (January to March) the routine activities of the Entomologist have comprised :—

	Inward	Outward
Correspondence ...	200	220
Safari by car ...	1,437 miles	—
" " foot ...	40 "	—
Nights on duty off station, 15.	—	—

4. *Visiting Entomologists*.—Mr. Colin Smee, Nyasaland Department of Agriculture, for study of coffee growing conditions, and Dr. R. H. LePelly Kenya, for inquiry into *Lygus simoneyi* on coffee.

5. *Publications*.—Entomological articles which have appeared in the press of the Territory during past years are in course of preparation and issue as a series of entomological leaflets. Numbers 1 to 6 have already been issued and numbers 7 and 8 are in the press.

6. *Locusts*.—The escape swarms of the anti-hopper operations of January to February, 1930 (see paragraph 21 *et seq.* Report of 1929-30) were sufficiently scattered and of small dimensions so as to suffer during the

maturation period a considerable diminution from natural control factors. An area of a few acres of eggs resulted in late April to the south of Moshu and was successfully dealt with, since when anti-Schistocerca activities in the north-eastern area have ceased.

7. *Silk*.—During the Entomologist's absence silk work has been in abeyance. Cold storage and incubator equipment for further experimental work has been received and awaits installation.

With the personal interest and management of Captain Karimura of the s.s. *Panama Maru*, a quantity of planting material of a collection of five selected mulberry varieties from the Japan Cotton Trading Company, Limited (Nippon Menkwa Kabushiki Kaisha), was delivered in good order in Dar es Salaam and these have been added to the collection at the Entomological Laboratory at Morogoro. We record our appreciation of this valued assistance.

8. *Coffee Pests*.—Since returning from leave, residence of the Entomologist in the Northern Province at Moshu has been arranged and a programme of intensive work on coffee pests commenced. Kenya Mealy-bug (*Pseudococcus lilacinus*, (Kll.) and the Coffee Bean Borer (*Stephanoderes*, Ferr.) are still notable absentees from our premier Arabian coffee areas of the Northern Province.

9. *Erratum*.—In the Entomological Report 1929-30 (Report of the Department of Agriculture, Part II, page 38, paragraph 8) for *Trifolium repens* read *Melilotus alba*.

ARCHIBALD H. RITCHIE,
Entomologist.

ANNEXURE VI.

REPORT OF THE ASSISTANT ENTOMOLOGIST.

Staff.—The Assistant Entomologist has been on duty throughout the year and in charge during the absence on vacation leave of the Entomologist from 4th May to 22nd December, 1930.

2. *Touring*.—The following localities have been visited during the year:—

- i. Mikindani, Lindi, Kilwa.
- ii. Tabora, Kahama, Shinyanga.
- iii. Mwanza, Shinyanga and Nzega.
- iv. Kaguru Mountains (Kilosa District), Mpwapwa.
- v. Kilosa, Kimamba.
- vi. East Uluguru Mountains (Morogoro District).

Two thousand seven hundred miles have been travelled by car and lorry on Government service.

3. *Correspondence*.—Mail dealt with has been as follows:—

Inward 912. Outward 646.

4. *Library and Collections*.—A card index of publications in the library has been prepared.

The systematic arrangement of the insect collection in cabinets has been commenced and the following orders completed:—Hemiptera, Diptera, Hymenoptera.

5. *Publications*.—Articles have been written for the local press on topical subjects, including Rat Poisons, the Migratory Locust, Beeswax Production. Entomological leaflet No. 7, entitled *Stickers and Spreaders in Spray Mixtures* has been produced.

6. *Exhibits for Shows*.—An exhibit illustrating the preparation of beeswax and the improved native hive, together with an exhibit of mulberry silk produced at the laboratory, was prepared for the Nairobi Agricultural Show (Kenya Colony) in January, 1931.

7. *Apiculture*.—The table below gives comparative figures of the export of beeswax from various ports during the years 1929 and 1930 :—

Port of Entry	1929		1930	
	Cwts.	Value £	Cwts.	Value £
Dar es Salaam	4,987	36,094	2,793	14,014
Mwanza	—	2	23	128
Lindi... ..	1,619	11,327	865	5,728
Tanga	29	166	56	261
Kilwa	72	477	30	128
Other ports	14	83	6	38
Total ...	6,721	48,149	3,773	20,297

The decline in the quantity exported is attributed to climatic conditions. The colonies, weakened by drought in 1929, were depleted by the excessive rains in 1930, which prevented foraging. Large numbers of empty hives were noted, particularly in the Lindi Province. Stores of honey were small in consequence. There is a considerable activity this year, swarms are particularly numerous and the honey flow is good.

A standard British frame hive was erected at the Entomological Laboratory in June and was occupied by a swarm within a week. Five brood frames were filled with brood and stores in October and ten in December. On 12th December a super was added. On 3rd March, two super frames were found filled and capped with pure white wax; five pounds of honey-comb were removed. Other frames were in various stages of development. There has been no hesitation in the bees taking to standard foundation and inter-frame space has required no adjustment. This hive is painted white, insulated inside with fibre board and protected from the sun by a grass shelter. Adjoining is a hive consisting of a plain wooden box, creosoted outside and without any protection from the sun. Both hives were occupied by swarms within a week of each other. The box hive has produced only quarter pound honey-comb to date and the bees are extremely difficult to handle. Observations go to show that bees kept in a cool hive are not difficult to handle, whereas the fierceness of bees in native hives, roofs, etc., not protected from extreme heat, is well known. The availability of water for drinking is considered, from field observations, to be one of the most important factors governing the bee population of an area.

The total number of beehives of all kinds in occupation at the laboratory is thirteen.

The two compartment queen-excluded bark hive ("Tanganyika" pattern) is being tried out on a large scale in the Tabora Province. A trained Native

Instructor is stationed at Kahama to supervise the preparation of these hives and to assist with the improvement in the preparation of wax for marketing.

8. *Cotton Pests*.—The following require to be added to the lists of cotton pests given in previous reports:—

Anoplocnemis curvipes, F. Coreidæ. On bolls.

Diplognatha silicea, MacL. Cetoniidæ. On bolls.

Dysdercus intermedius, Dist. Pyrrhocoridæ. On bolls.

Dysdercus superstitiosus, F. On bolls.

Helopeltis bergrothii, Reut. Capsidæ. On flower and young shoots.

Hotea subfaciata, Westw. Pentatomidæ. On bolls.

Macroraphis spurcata, Wlk. Pentatomidæ. On bolls.

Nezara viridula, L. var. *torquata*, F. Pentatomidæ. On bolls.

Tragocephala variegata, Bert. Cerambycidæ. Barking stems.

Owing to the sudden cessation of the rains and the absence of showers in June, the damage in the Morogoro-Kilosa area due to the early bollworms, particularly *Chloridea obsoleta*, was more noticeable than usual as the plants were slow in putting forth new flowers.

Earias spp. were responsible for a large amount of damage to cotton buds and flowers, particularly in the Shinyanga area. Cotton stainers (*Dysdercus* spp.) were exceptionally few in number. In spite of the lateness of numerous plantations in Morogoro and Kilosa, the usual appearance of great quantities of stainers in October and November did not take place.

Pink Bollworm (*Platyedra gossypiella*) was more in evidence than usual. This was no doubt due in part to the lateness of the crop, occasioned by the destruction of the buds by *Earias*, and by the lateness in planting areas which had been flooded. Figures obtained by boll examinations in the neighbourhood of Morogoro are given below. Corresponding figures for August, 1929, and October, 1928, are given for comparison. It must be stated that by October, 1928, it being a normal season, the crop had been picked almost completely, whereas this was not the case in 1930:—

			No. of Bolls Examined	Sound locules	Bollworm Damaged	Stained locules	<i>Platyedra</i> per 100 locules
1930.				%	%	%	
May	...	...	250	82.3	0.0	17.3	—
June	...	...	600	55.5	18.3	26.2	1.5
July	...	...	—	—	—	—	—
August...	...	...	1,525	46.1	19.5	34.4	7.8
September	...	...	1,100	50.3	16.0	33.7	7.8
October	...	...	625	65.3	15.2	19.5	8.8
November	...	...	800	43.3	35.7	21.0	26.0
December	...	...	500	53.1	25.0	21.9	14.0
1931.							
January	...	...	200	53.8	12.6	33.6	9.0
February	...	...	300	78.8	5.6	15.6	2.0
1929.							
August...	...	...	400	53.0	14.4	52.6	3.0
1928.							
October	...	...	250	12.9	24.9	62.9	9.5

Figures for December to February were obtained from a plot on the Experimental Station left standing for this purpose. The rapid increase of the *Platyedra* incidence during November is noteworthy and indicates the value of early maturity for cotton in this area. The total number of cotton bolls examined during the year was 10,000.

9. *Food Crop Pests*.—During February and March maize and millets in the Central and Eastern Provinces have been seriously attacked by caterpillars in some areas. The Army Worm, *Laphygma excrucians*, Wlk. and an unidentified Sphingid were in evidence throughout the Morogoro administrative district.

White grubs (*Rutelidae*) have been received from Mikindani, where they are reported attacking the roots of rice.

Ootheca benigiani, Weise., has again been serious on early planted legumes in Morogoro and Lindi Province.

10. *Forest Pests*.—A study of the gall forming Psyllid, *Phytolyma lata*, Wlk., has been commenced for the Conservator of Forests. The insect attacks the leaves and shoots of young myule trees (*Chlorophora excelsa*) during the dry season, causing defoliation, deformation and, in extreme cases, death of the sapling. The larval stage is passed within the gall formed and lasts about three weeks. This pest is rendering the reafforestation of certain areas, with one of our most valuable timber trees, a difficult problem.

11. *Locusts*.—The red winged locust, *Nomadacris septemfasciata*, Serv., was reported on 29th March, 1930, as having appeared in swarms at Rungwe, Ufipa District, in the extreme south-west of the Territory. The direction of flight was from south-east to north-west. They are stated to have covered a large area of country in numerous comparatively small and scattered flights. They were again reported towards the north-east of the Ufipa Plateau a month later. During July and August reports were received of swarms in the Ufipa and Kitunda Districts, but the country is so vast and unpopulated and communications so difficult that no real idea of the actual state of affairs can be expressed. In October a swarm crossed the railway half way between Tabora and Kigoma going south; this, it is suggested, being a swarm which had moved north unreported, or the progeny of such a swarm. Hoppers were reported for the first time from the south-end of Lake Rukwa at the end of December, moving south-east. They were mostly killed by birds and the resulting small swarm of adults flew away south over the Rhodesian border.

This locust has not been reported in the swarming phase since 1898-99, when it occurred from the Usambara Mountains to Lake Nyasa, and 1901, in Bukoba (La Baume, Beihefte zum Tropicenpflanzer, 1910). The solitary phase, *coarctata*, Luc., is not uncommon; (see Miller, Proc. Ent. Soc. 1929).

W. VICTOR HARRIS,
Assistant Entomologist.

ANNEXURE VII.

REPORT OF THE MYCOLOGIST.

The Mycologist was absent from Morogoro from 1st to 14th April, 1930, on local leave, and from 13th August, 1930, onwards on vacation leave. The report for the year is therefore brief.

2. Plantations were visited at Dar es Salaam from 15th to 29th April, 1930; Soga from 8th to 11th May, 1930; Mpwapa 21st and 22nd June, 1930.

3. The main work of the laboratory continues to be advisory. Correspondence dealt with before proceeding on vacation leave was 203 letters. Letters and material which reached the laboratory after 13th August, 1930, were retained to receive attention on the Mycologist's return.

4. Nine leaflets dealing with diseases of coffee were published for circulation within the Territory. An article was published in *Tropical Agriculture* (Vol. VIII, No. 1), entitled "A Coffee Bean Disease". This paper had the object of bringing to the attention of other coffee growing countries the disease caused by *Nematospora Coryli*, which had been first described in this country in 1930.

5. The Imperial Mycological Institute have made seventeen identifications of fungi on economic plants in the Territory. These are detailed below :—

MISCELLANEOUS DISEASES.

Bougainvillea spectabilis Willd.—A *Phomopsis* was identified on wilted twigs. It is rare in the country and unimportant.

Carnation (*Dianthus Caryophyllus* L.).—The rust fungus, *Uromyces caryophyllinus* (Schran.) Wint., has been observed causing injury to this plant.

Caster Oil Plant (*Ricinus communis* L.).—The rust of the leaves, *Melampsorella Ricini* (Biv. Bern.) de Toni, has been found fairly widespread.

Citrus spp.—A form of canker and a die-back were recorded in the last Annual Report. The fungi concerned have been identified from lemon trees (*Citrus Limona* Osbeck) as *Phyalospora* sp., probably *P. fusca* Stevens, on the bark, and *Haplosporella* (*Sphaeropsis*) sp., intermediate in size between *Sp. malorum* and *H. hesperidica* Speg., on the twigs.

Cow Pea (*Vigna sinensis* Endl.).—Yeast spots due to *Nematospora Coryli* Pegl. has been observed on this crop.

French Haricot Beans (*Phaseolus vulgaris* L.).—A root fungus, probably *Rhizoctonia bataticola* (C. strain) (*Macrophomina Phaseoli* (Maubl) Ashb.) has been found to be the cause of considerable destruction.

Kapok (*Eriodendron* sp.).—*Ramularia Eriodendri* Racib. is found to cause considerable spotting of leaves in young plants grown under damp conditions.

Mango (*Mangifera indica* L.).—An angular spotting of the leaves is identified by the Mycologist as the same as that caused by *Bacillus mangiferae* and described in South Africa by Doidge. It is very common and appears to be more destructive on young plants.

Mulberry (*Morus alba* L.).—*Spharopsis Mori* Berl. on the stems and the rust fungus *Kuchicola Fici* Butl. on the leaves have to be added to the parasites of this crop in Tanganyika. The rust causes considerable injury as it may wither up many leaves on one tree. On cuttings of *M. indica* L. the fungus (?) *Eutypa ludibunda* Sacc. was observed. The cuttings had been planted out and were not thriving; the parasitism is doubtful.

Oleander (*Nerium oleander* L.).—An angular spot of the leaves and a disease of the stems have been identified by the Mycologist as agreeing sufficiently closely with the organism described as *Pseudomonas savastanoi* E.F.S., var. *Nerii*. The effect is disfiguring to the tree. It has been noticed less abundantly in the Moshi District than in the Morogoro District.

Pigeon Pea (*Cajanus indicus* Spreng.).—An unusual wilting of this crop was observed in material from the Uluguru Mountains. A *Lisca* sp. and a *Fusarium* sp. were present on the stems. Since mealy bugs were present at the roots, the degree of parasitism of the fungi is doubtful. No further occurrence has come to light to solve the problem. *N. Coryli* was identified in the seeds. This fungus is probably the most destructive parasite of leguminous crops in the Territory.

Tepary Beans (*Phascolus acutifolius* Gray).—*N. Coryli* has been observed in this crop also.

Tropicolum majus L.—A powdery mildew, *Oidiopsis taurica* (Lev.) Salm., is common on the leaves.

COCONUT WILT.

6. An examination was made in April, 1930, of palms at the coast at Dar es Salaam and for some miles south. A number of palms showing early stages of wilt were felled and examined. In each case tunnels, made by palm beetles, were seen running down into the cabbage, where a rot was being set up. Endeavours to reveal any *Phytophthora palmicola*, the cause of true bud rot, by cultural methods were not successful. The results agree with conclusions arrived at on previous occasions that the disease is due to penetration by saprophytic bacteria into the beetle tunnels, where they establish themselves on the injured parts, ultimately destroying the cabbage.

7. Observations made at several parts of the coast indicate that there are quite a number of factors contributing to an unhealthy condition of the palms. Examples are: the nearness of the water table to the soil surface and general lack of drainage; the presence of wild shrubs and tall grass round the palms; the injurious practice of firing the weed through the plantations; general neglect to destroy dead palms and the accumulating rubbish. Such cases are rendered conspicuous by contrast to plantations where, by sound agricultural practice and sanitary measures, the trees are thriving and such diseases as wilt and gummosis are negligible.

SISAL "BANDING DISEASE" EXPERIMENTS.

8. Diseased plants, since their removal to other types of soil, have shown no further signs of the banding disease during twelve months, whereas large numbers of leaves on plants on the original site continue to manifest the trouble. As the experimental area was inadvertently cut over, the manurial and other experiments have been repeated.

“YEAST SPOT” OF LEGUMES.

9. The number of leguminous species affected by Yeast Spot continues to be added to. The extensive damage and loss is illustrated by the following figures. In one case, five thousand tepary beans were examined. The proportion of healthy to diseased seed by volume were five to two. Had all the seeds been sound, the total volume would have been eight units. The crop consisted, therefore, of proportions equivalent to five bags healthy seed and two bags diseased; whereas, had the crop been sound, it would have been eight bags. Again, Tephrosia, though not a food crop, produced a crop, half the seed of which were diseased and a further quarter destroyed by insects.

G. B. WALLACE,
Mycologist.

APPENDIX I.

LIST OF EUROPEAN STAFF ON 31ST DECEMBER, 1930.

- DIRECTOR: E. Harrison, M.S.A. (Ames.), B.Sc. (Edin.), N.D.A. (Hons.), Morogoro.
- ENTOMOLOGIST: A. H. Ritchie, Moshi.
- ASSISTANT ENTOMOLOGIST: W. V. Harris, M.Sc. (Dunelm.), A.I.C.T.A., Morogoro.
- MYCOLOGIST: G. B. Wallace, B.Sc., Ph.D., on leave.
- AGRICULTURAL ECONOMIST: R. R. Staples, M.A. (Cantab.), C.D.A. (Cantab.), Morogoro.
- SENIOR AGRICULTURAL OFFICERS: J. F. C. O'Brien, C.D.A. (Hons.), Morogoro; C. K. Latham, B.Sc. Agric., Lindi; A. S. Richardson, B.Sc. (Edin.), Mwanza; A. J. Wakefield, B.Sc. (Edin.), N.D.A., N.D.D., Moshi.
- AGRICULTURAL LECTURER: A. E. Haarer, F.L.S., Dip. Hort., R.H.S., Morogoro.
- DISTRICT AGRICULTURAL OFFICERS: L. C. Edwards, Dip. Hort. R.H.S., Biharamulo; D. G. Burns, B.A. (Cantab.), Mwanza; C. M. H. Sutherland, B.Sc., B.Sc. Agric. (Aberd.), on leave; C. B. Garnett, M.A. Agric. (Cantab.), Singida; D. Sturdy, B.A. Agric. (Cantab.), Arusha; H. Musk, A.I.C.T.A., Mpanganya; C. Harvey, B.Sc. Agric., A.I.C.T.A., Moshi; A. S. Stenhouse, B.Sc., on leave; H. Marshall, B.Sc. (Edin.), N.D.A., N.D.D., Shinyanga; C. J. McGregor, C.D.A., on leave; N. V. Rounce, C.D.A., A.I.C.T.A., Kasulu; A. H. Savile, C.D.A., A.I.C.T.A., Biharamulo; T. C. Cairns, B.Sc. (Edin.), Songea; J. E. Bruce, N.D.A., N.D.D., Lushoto; W. B. Hutchinson, N.D.A., Nzega; R. D. Linton, B.Sc. Agric. (Belfast), A.I.C.T.A., Mpapura, Mikindani; B. J. Hartley, N.D.A., A.I.C.T.A., Shanwa, Maswa; F. R. Sanders, B.A. (Hons.) (Cantab.), C.D.A., Moshi; J. Robertson, B.Sc. Agric. (Aberd.), A.I.C.T.A., Mpanganya, Rufiji; F. W. Thomas, C.D.A. and C.D.F. (Glasgow), Tanga; R. B. Alhutt, B.Sc., B.Sc. Agric. (London), Masasi; R. M. Davies, B.Sc., B.Sc. Agric. (Aberd.), Mufindi; J. R. Curry, N.D.A., Dodoma; N. R. Fuggles, B.Sc. (London), C.D.A. (Cantab.), A.I.C.T.A., Morogoro; G. W. Lock, N.D.A., N.D.D., Kilwa; D. Thornton, B.Sc., Mwanza; R. M. Maynard, Dar es Salaam.
- HEAD GARDENER: T. H. Marshall, Cert. Kew, on leave.
- AGRICULTURAL ASSISTANTS: E. T. Ward, Morogoro; R. W. Collett, Bagamoyo; T. S. Jervis, Bukoba; L. Leslie Moore, Bukoba; G. S. Brown, Shinyanga; G. H. Turnbull, Moshi; B. E. Eustace, Tukuyu; A. Taylor, Moshi; J. S. Scott, Ngudu; R. Shaw, Mpanganya; W. Sibley-Warne, Tunduru; G. H. Pattison, Sumbawanga, Ufipa; C. J. M. Krige, B.Sc. Agric., Iringa; T. D. K. Ferreira, Mpapura, Mikindani; W. C. Clarke, Mwanza.
- CHIEF CLERK: W. E. Pownall, Morogoro.
- CLERKS: C. H. Taylor, Morogoro; D. F. T. Brown, Morogoro.

APPENDIX II.

PLANT INTRODUCTION AND DISTRIBUTION.

(a).—Distribution of planting material from Agricultural Stations and sub-stations during the year.

Cotton Seed	...	...	...	...	...	1,050 tons.
Groundnuts	...	...	...	...	...	24,300 lbs.
Maize	...	...	...	...	...	68,619 lbs.
Millet and Sorghums	...	...	...	...	...	26,859 lbs.
Beans and Peas	...	...	...	...	...	8,700 lbs.
Rice	...	...	...	...	...	4,513 lbs.
Simsim	...	...	...	...	...	209 lbs.
Wheat and Barley	...	...	...	...	...	589 lbs.
Coffee	...	...	...	...	...	35,386 seedlings.
Cassava	...	...	...	...	...	76,000 cuttings.
Cover crops	...	...	...	...	...	879 lbs. seed.
Fodder crops	...	...	...	...	...	426 lbs. seed.
Fruit plants	...	...	...	...	...	1,280 plants & cuttings. 9 lbs. seed.
Vegetable seeds	...	...	...	...	...	963½ lbs. seed. 53 pkts. seed.
Shade and Wing-break Trees	...	...	...	...	...	59 lbs. seed. 42 pkts. seed.
Ornamental Trees and Shrubs	...	...	...	...	...	4,625 plants & cuttings. 2,409 plants & cuttings. 22 pkts. seed.

(b).—Plant Introductions from other Countries.

OIL SEEDS:

Aleurites Fordii (Tung-oil tree).
Aleurites montana (Tung-oil tree).
Aleurites moluccana (Candle-nut tree).
 Olive: variety "Surri" (from Cyprus).
 Olive: variety "Hawari" (from Cyprus).
Parilla ocimoides (from India).
 Groundnuts: four selections (from South Africa).

COTTON VARIETIES:

Cambodia: strain Co. 2 (from Coimbatore, India).
 U/4: selection C. 15 (from Barberton, South Africa).
 U/4: " H. 67 (" " " ").
 U/4: " Z. 14 (" " " ").
 U/4: " Z. 9 (" " " ").
 U/4: " H. 77 (" " " ").
 U/4/4 (" " " ").
 U/4/4/2 (" " " ").
 U/4/4/10 (" " " ").
 Isham: bulk strain A. (" " " ").
 Isham: single plant selection A. (from Nigeria).
 Isham: " " " " B. (" " " ").
 Isham: " " " " C. (" " " ").
 Uganda Upland: S.G. 29 (from Uganda).

TOBACCO VARIETIES:

Virginia:	var.	Heavy Western	(from Nyasaland).
"	:	"	Rustenburg Selection (from South Africa).
"	:	"	Amorello (" " ").
Turkish:	"	Revika	(" " ").
"	:	"	Xanthi-yaka (" " ").
"	:	"	Yerkish (" " ").
"	:	"	Hemetley (" " ").
"	:	"	Serrees (" " ").
"	:	"	Maisonley (" " ").
"	:	"	Many Leaf Soulook:
			special selection (" " ").
"	:	"	Many Leaf Soulook:
			general crop (" " ").

FOOD PLANTS:

Sweet Potato	(from Southern Rhodesia).
<i>Eleusine coracana</i>	(from Coimbatore, India).
Maize: Yellow Flint:	strain 84,387 (from Russia).
" :	" " : " 5,572 (" " ").
" :	" " : " 5,549 (" " ").
" :	" " : " 67,014 (" " ").
" :	" " : " 67,154 (" " ").
" :	" " : " 84,388 (" " ").
" :	" " : " 84,128 (" " ").
" :	" " : " 5,550 (" " ").
" :	" " : " 84,170 (" " ").
" :	var. Golden Beauty (from South Africa).
" :	" Yellow Boesman (from South Africa).
<i>Sechium edule</i>	(from United States of America).
Wheat: var. Lalkasarwali	(from South Africa).
Edible Canna	(from Kenya).
Bulrush Millet:	six selections (from Madras, India).
Sorghums:	nine selections (from South Africa).
Groundnuts:	four selections (from South Africa).

FRUIT PLANTS:

Almond	(from Cyprus).
Sampson Tangelo	(from California).
Olive: var. "Surri"	(from Cyprus).
Olive: var. "Hawari"	(from Cyprus).
Orange: var. Binti Juma	(from Zanzibar).
Almonds: "	Britz (from South Africa).
" :	" Burbanks Seedling (from South Africa).
" :	" Nonpareil (from South Africa).
" :	" Princess (from South Africa).
Pecan Nut:	two varieties (from South Africa).
Carob Bean (<i>Ceratonia siliqua</i>)	(from Cyprus).
Mango: var. Caraboa	(from Philippines).
Queensland nut (<i>Macadamia ternifolia</i>)	(from Hawaii).
Brazil nut (<i>Bertholletia excelsa</i>)	(from Malay).
Pangi (<i>Pangium edule</i>)	(from Philippines).
Walnut (<i>Juglans regia</i>)	(from South Africa).
Mamme Apple (<i>Mammea americana</i>)	(from Gold Coast).

FODDER PLANTS :

- Geijera parviflora* (from Australia).
 Kudzu Vine (*Pueraria thumbergiana*) (from South Africa).
 Carob Bean (*Ceratonia siliqua*) (from Cyprus).
 Lucerne: Chinese Winter (from South Africa).
 " : Hunter's River (from South Africa).
 Salt Bush: Old Man variety (from South Africa).
Canna edulis (from Kenya).
Medicago denticulata (from Australia).
 Tagasate (*Cytisus proliferans*) (from Australia).
 Dwarf Salt Bush: (*Atriplex angulata*) (from Australia).

INSECTICIDAL PLANTS :

- Insect Powder Plant (*Chrysanthemum cinerariaefolium*)
 (from Kew and France).
 Tuba Root (*Derris elliptica*) (from Ceylon).

COVER CROP AND GREEN MANURING PLANTS :

- Indigofera arrecta* (from Java).
Indigofera endecaphylla (from Java).
 Sunn Hemp (*Crotalaria juncea*) (from Southern Rhodesia and Kenya).

SHADE TREES :

- Sesbania cinerescens* (from South Africa).
Virgilina capensis (from South Africa).

ORNAMENTAL PLANTS AND TIMBER TREES :

- Indian Mahogany (*Cedrela toona*) (from South Africa).
Swietenia Mahagoni (from Virgin Islands and United States of America).
Wistaria frutescens (from United States of America).
Liriodendron tulipifera (" " " ").
Cyathea medullaria (" " " ").
Jussiaea decurrens (" " " ").
Jacaranda (" " " ").
 Pride of India: two varieties (from India).
Mussaenda erythrophylla (from Gold Coast).
Dracena australis (" " " ").
Encephalartos bateri (" " " ").
Metrosideros tomentosa (" " New Zealand).
Metrosideros villosa (" " " ").
Cyathea undularis (" " " ").
Eucalyptus jicifolia (" " " ").
Myosotidium nobile (" " " ").
Coprosma grandiflora (" " " ").
Pomaderris apetala (" " " ").
Hoheria populnea (" " " ").
Montanoa bipinnatifida (" " Gold Coast).
Bauhinia purpurea (" " " ").
Solanum macranthum (" " " ").
Thumbergia grandiflora (" " " ").

APPENDIX III.

LIST OF GINNERIES EXISTING IN 1930-31.

Province and District	Locality	Number of Gins		Licencee
		Saw	Roller	
<i>Eastern :</i>				
Dar es Salaam ...	Ruvu ...	1	26	India-Uganda Cotton Mer., Ltd.
" ...	Dar es Salaam ...	1	16	Liverpool-Uganda Co., Ltd.
" ...	Pugu ...	1	11	Abdulasul and Sons
Morogoro...	Duthumi ...	1	8	Tanganyika Cotton Co., Ltd.
" ...	Turiani ...	—	6	" "
" ...	Morogoro ...	—	28	" "
" ...	Mlali ...	—	18	" "
" ...	Mkata ...	—	12	" "
Kilosa ...	Msowero ...	—	6	Kladitis and Samaras
" ...	Rudewa ...	—	14	Tanganyika Cotton Co., Ltd.
" ...	Kilosa ...	—	14	E.A. Sisal Plantation, Ltd.
Bagamoyo ...	Bagamoyo ...	1	8	The Catholic Mission of the Holy Ghost Fathers
Rufiji ...	Kilimani ...	—	12	Kilimani Estates
<i>Lindi :</i>				
Lindi ...	Lindi ...	—	10	Mathuradas Kalidas
" ...	Mtua ...	—	8	" "
Kilwa ...	Kikanda ...	1	8	Jaffer Samji and Co.
<i>Northern :</i>				
Moshi ...	Himo ...	1	12	Moshi Trading Co., Ltd.
<i>Tabora :</i>				
Shinyanga ...	Usogore ...	4	—	B.E.A. Corporation, Ltd.
" ...	Lohumbo ...	4	—	" "
<i>Mwanza :</i>				
Mwanza ...	Mwanza ...	—	20	Nakasero Trading Co., Ltd.
" ...	Nyambiti ...	2	6	B.C.G. Association
" ...	Pambani ...	—	11	Kampala General Agency
" ...	Murutunguru ...	1	10	The White Fathers Mission
" ...	Bukumbi... ..	—	12	Bhagwanji Sunderji and Co.
" ...	Nyanguge ...	2	8	B.C.G. Association
" ...	Nassa ...	—	12	Narandas Rajaram and Co.
" ...	Malampaka ...	5	—	B.E.A. Corporation, Ltd.
" ...	Runere ...	5	—	" "
" ...	Ihale ...	—	11	Mwanza Cotton Tdg. Co., Ltd.
<i>Bukoba :</i>				
Biharamulo ...	Biharamulo ...	2	—	B.C.G. Association

APPENDIX IV.

TANGANYIKA TERRITORY—PRINCIPAL EXPORTS, 1913 AND 1926-27-28-29-30

Export	1913				1926				1927			
	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order
Sisal	416,680	535,580	30.1	I	500,400	911,293	29.1	I	660,240	1,160,735	33.7	I
Hides and Skins	69,120	274,511	15.4	III	41,907	164,435	5.3	V	55,802	238,890	7.0	IV
Cotton	43,840	120,753	6.7	IV	97,723	427,437	13.7	III	78,814	361,916	10.5	III
Copra	109,540	117,401	6.6	V	146,900	152,228	4.9	VI	145,340	143,024	4.2	VI
Groundnuts	179,220	95,932	5.3	VI	317,340	254,903	8.1	IV	282,940	238,082	6.9	V
Beeswax	11,180	70,743	4.0	VII	6,147	48,179	1.5	IX	11,169	80,863	2.4	VII
Coffee (Raw)	21,180	46,563	2.6	VIII	130,793	495,199	15.8	II	131,899	463,420	13.5	II
Simsim	29,520	20,407	1.1	XI	71,260	68,585	2.2	VII	74,660	74,017	2.2	VIII
Rice	15,420	8,717	0.5	—	65,295	57,564	1.8	VIII	78,820	72,253	2.1	IX
Millet	18,210	5,498	0.3	—	58,126	24,094	0.8	—	72,268	29,164	0.9	X
Total	913,910	1,296,105	72.6	—	1,435,951	2,603,917	83.2	—	1,591,952	2,862,304	83.4	—
Plantation Rubber	25,740	309,195	17.5	II	7,151	41,310	1.3	X	1,738	7,065	0.2	—
Ghee	6,656	15,400	0.8	X	7,428	32,377	1.0	—	7,912	30,015	0.9	X
Cotton Seed	—	—	—	—	105,900	22,185	0.7	—	91,320	18,440	0.5	—

Export	1928				1929				1930			
	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order	Quantity Cwts.	Value £	Per cent. of Total Value	Order
Sisal	723,720	1,111,429	27.4	I	914,560	1,485,593	39.9	I	999,240	1,172,315	44.6	I
Hides and Skins	65,848	374,830	9.3	IV	50,988	223,002	5.9	IV	41,872	123,471	4.7	V
Cotton	97,863	495,405	12.2	III	98,948	487,863	13.1	III	73,414	247,413	9.4	III
Copra	186,360	191,197	4.7	V	158,400	145,015	3.8	V	147,900	109,733	4.2	VI
Groundnuts	211,900	188,582	4.7	VI	155,300	120,448	3.2	VI	346,660	186,567	7.1	IV
Beeswax	9,815	71,079	1.7	VIII	6,721	48,149	1.2	IX	3,773	20,297	0.7	IX
Coffee (Raw)	208,622	739,657	18.3	II	177,140	588,871	15.8	II	230,940	397,040	15.0	II
Simsim	64,300	61,342	1.5	IX	85,120	74,773	2.0	VII	62,300	32,547	1.2	VIII
Rice	79,973	85,884	2.1	VII	51,884	58,985	1.5	VIII	90,131	73,682	2.8	VII
Millet	154,636	52,243	1.3	X	95,323	30,334	0.8	—	36,288	8,234	0.3	—
Total	1,803,037	3,371,648	83.2	—	1,794,384	3,263,033	87.2	—	2,032,518	2,371,299	90.0	—
Plantation Rubber	673	3,008	0.1	—	153	597	0.01	—	—	—	—	—
Ghee	10,002	37,924	0.9	—	9,073	36,547	0.9	—	5,860	16,385	0.6	X
Cotton Seed	139,240	33,099	0.8	—	174,640	46,550	1.2	X	72,380	11,891	0.5	—

APPENDIX V.

STATION : DAR ES SALAAM, 1930.

Longitude, 39° 40' E. Latitude, 6° 80' S. Altitude, 20 feet.

AIR TEMPERATURE (° CENTIGRADE)

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB		Rainfall in millimetres (Day with rain=0.2 mm.)		No. of days of rain
	Dry Bulb		Mean ± (Max + Min)		Means of		Absolute Max. and Min.		9 h.		14 h		Total for month	Max. in any one day	
	9 h	14 h	Max.	Min.	Max.	Min.	Date	Min.	Date	9 h.	14 h				
January	28.1	29.9	27.8	31.4	24.3	33.0	20.5	20.5	3	4, 11, 17, 18, 19, 20	25.3	26.0	127.0	73.6	4
February	27.4	29.2	27.1	30.5	23.7	32.0	21.0	21.0	5, 7	10, 11, 13, 14, 31	25.2	25.8	167.1	40.6	5
March	25.5	28.6	26.6	30.3	23.0	32.0	22.0	22.0	7, 9, 11, 12, 13	24.7	25.6	288.5	44.6	25	
April	26.8	28.6	26.5	30.4	22.6	32.0	19.0	19.0	16, 17, 20	24.5	24.8	263.4	88.8	13	
May	25.7	29.4	25.7	30.3	21.2	33.0	16.0	16.0	6	20, 28	22.4	23.1	11.3	5.4	11
June	23.9	28.7	24.1	29.9	18.3	31.5	16.0	16.0	2, 25	30	20.7	21.2	Trace	Trace	27
July	23.9	28.1	23.9	29.3	18.5	31.5	17.0	17.0	12, 13	2	20.6	20.9	25.2	24.2	14
August	23.8	27.4	24.3	28.9	19.8	30.9	17.0	17.0	8	2	21.8	23.0	52.2	34.8	24
September	25.3	27.2	24.4	28.5	20.4	31.1	19.0	19.0	6	22	23.1	24.2	26.8	14.2	8
October	27.4	28.9	26.0	30.3	21.7	33.1	20.0	20.0	23	12	24.1	24.8	10.3	5.7	23
November	27.5	28.7	26.3	29.9	22.8	32.0	20.1	20.1	12	15	24.5	24.9	160.9	34.8	22
December	28.9	30.2	28.3	31.5	25.1	34.0	22.0	22.0	29	15	25.7	25.9	26.5	6.6	4

STATION : MWANZA, 1930.

Longitude, 32° 53' E. Latitude, 3° 32' S. Altitude, 3,709 feet.

AIR TEMPERATURE (° CENTIGRADE)

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB 9 h 14 h	Rainfall in millimetres (Day with rain = 0.2 mm.) Total for Month	No. of days of rain In any one day		
	Dry Bulb		Mean	Means of		Absolute Max. and Min.									
	9 h	14 h	± (Max + Min)	Max.	Min.	Max.	Min.	Date	Date						
January	21.9	25.0	22.3	26.8	17.8	30.5	15.0	23	2	20.0	21.6	70.0	20.2	27	17
February	22.6	24.8	22.8	27.5	18.2	32.3	16.3	22	5	19.6	21.9	206.5	94.0	3	8
March	21.8	24.2	22.6	26.9	18.4	30.0	16.1	15	21	20.3	21.9	278.2	42.0	2	19
April	21.0	24.4	21.8	26.1	17.6	29.1	15.1	1	4	20.0	22.7	249.9	65.2	7	24
May	21.4	25.7	22.1	27.0	17.3	29.0	15.5	25	14	20.8	25.4	54.7	23.8	7	7
June	20.8	27.0	21.5	27.6	15.5	29.6	14.3	22	23	20.2	26.7	5.8	5.8	7	1
July	19.9	27.0	23.0	27.3	18.8	29.5	13.8	6	1	19.6	26.8	14.0	10.8	27	3
August	21.4	27.8	22.0	28.5	15.6	30.8	14.4	24	9	20.9	27.4	—	Trace	9	1
September	22.8	27.4	22.5	28.4	16.6	30.6	15.5	8	13, 30	22.4	27.1	143.5	85.3	17	9
October	23.2	26.9	22.2	27.9	16.6	31.2	15.0	14	16, 17	22.3	26.3	70.2	25.3	2	10
November	23.9	27.4	23.1	28.7	17.5	31.5	15.2	9	23	21.9	26.3	92.9	16.2	16	17
December	23.8	27.4	22.8	28.5	17.1	31.5	16.0	25	4, 5, 12, 16, 17, 18, 27	19.9	23.4	76.7	50.2	12	12

APPENDIX V. (Contd.)

STATION : ARUSHA, 1930.

Longitude, 36° 43' E.

Latitude, 3° 23' S.

Altitude, 4,415 feet.

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB		Rainfall in millimetres (Day with rain = 0.2 mm.)		No. of days of rain	
	Absolute Max. and Min.										9 h. 14 h.		Total for month		In any one day	
	Dry Bulb	Mean	Means of		Max.	Min.	Date	Min.	Date		9 h.	14 h.			Max.	Date
January	20.0	26.2	20.3	26.8	13.8	29.0	5, 9, 14, 16, 20	12.0	7, 8, 9, 15, 16, 21		17.6	19.3	82.0	33.5	26	13
February	18.5	25.0	20.0	25.3	14.8	27.0	3, 20	13.0	17, 18		17.4	19.7	94.3	46.5	11	14
March	18.2	23.3	19.5	23.8	15.2	26.0	3, 20	13.0	14		17.2	18.6	236.1	24.2	6	22
April	17.7	23.0	19.3	23.6	15.0	25.0	3, 4, 5, 6, 27, 30	14.0	2, 3, 4, 5, 27, 28, 29, 30		17.0	19.1	446.4	90.0	20	24
May	16.6	20.1	17.9	21.4	14.4	25.0	1, 2, 3, 5	13.5	20, 21, 27, 28, 31		15.4	17.2	195.1	42.9	8	17
June	14.8	18.4	15.9	19.8	12.0	21.5	3	8.5	16		12.9	14.3	19.5	10.0	8	6
July	14.3	19.2	15.9	20.2	11.7	23.0	29	9.5	1, 5		12.2	14.9	18.0	15.5	14	5
August	14.0	20.1	16.6	20.8	12.4	23.0	12, 21	10.5	5		13.1	15.8	8.0	3.5	21	7
September	16.0	21.7	17.9	22.7	13.2	27.9	16	12.0	2, 4		14.4	16.8	18.7	8.5	16	8
October	17.1	24.0	19.5	24.9	14.1	27.0	12, 13, 14	12.0	13, 14		15.8	17.6	68.1	24.6	15	9
November	19.3	23.5	20.1	25.3	15.0	27.0	7	12.5	29, 30		16.9	18.1	220.9	50.0	16	16
December	19.6	23.9	18.9	26.0	11.9	29.0	29, 31	10.0	29		17.1	18.5	26.3	18.2	4	4

STATION : AMANI, 1930.

Longitude, 38° 38' E.

Latitude, 5° 6' S.

Altitude, 3,004 feet.

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB		Rainfall in millimetres (Day with rain = 0.2 mm.)		No. of days of rain	
	Absolute Max. and Min.										9 h. 14 h.		Total for month		In any one day	
	Dry Bulb	Mean	Means of		Max.	Min.	Date	Min.	Date		9 h.	14 h.			Max.	Date
January	21.6	26.1	22.3	27.2	17.4	29.2	15	15.1	24		19.8	20.9	61.7	20.1	28	7
February	21.3	24.3	21.7	25.5	17.9	28.0	3	15.2	18		20.1	21.2	90.4	27.0	5	16
March	21.4	23.7	21.6	24.9	18.3	27.5	4	16.8	31		20.4	21.5	256.2	46.3	4	27
April	21.2	23.6	21.2	24.7	17.7	26.3	11, 24	16.1	3, 2		19.7	21.0	296.6	72.2	20	17
May	19.3	21.9	20.0	23.1	17.0	27.4	6	13.4	26, 27		17.5	18.7	74.4	20.6	29	13
June	17.8	21.1	18.5	22.2	14.9	24.7	18	12.9	11		15.7	17.2	7.5	2.0	13	7
July	17.4	20.8	18.0	22.0	14.1	24.4	13	11.4	6, 8		15.7	16.9	48.9	41.0	14	4
August	17.5	20.1	18.0	21.4	14.6	23.7	13	11.5	3		16.4	17.3	91.7	26.3	21	21
September	18.8	21.4	18.8	22.8	14.8	25.3	25	11.9	20		17.3	18.4	100.3	46.5	4	14
October	19.7	22.7	19.7	23.8	15.7	26.9	14	12.2	12		18.4	19.2	104.9	46.2	16	13
November	20.8	24.0	20.9	25.0	16.9	26.8	19	12.3	1		19.5	20.7	240.5	58.5	15	21
December	22.3	24.9	22.1	26.0	18.3	27.4	29, 30	15.9	4		20.4	21.2	150.9	26.2	2	23

APPENDIX V. (Contd.)

STATION: KIGOMA, 1930.

Longitude, 29° 38' E.

Latitude, 4° 52' S.

Altitude, 2,531 feet.

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB		Rainfall in millimetres			No. of days of rain
	Mean					Absolute Max. and Min.					9 h 14 h		Total for month			
	Dry Bulb	Mean	Max.	Min.	Max.	Date	Min.	Date	Max.	Date	9 h	14 h	Max.	Date	Rain	
January	23-1	24-3	24-1	28-2	20-0	30-0	23, 25	19-0	2, 3, 6, 7, 9, 24, 26, 28, 29, 30	21-4	22-8	31-0	14-2	6	4	
February	28-5	22-7	21-7	22-7	20-7	26-0	20, 24, 25	18-0	1	20-0	22-7	92-1	46-7	2	6	
March	22-5	24-0	24-0	28-3	19-8	30-0	1, 6, 7, 9, 31	18-5	7	21-5	23-4	233-8	59-6	5	11	
April	22-7	23-7	24-1	28-3	20-0	30-5	3	18-0	7	21-1	22-2	131-9	42-8	8	7	
May	22-4	24-7	24-1	28-6	19-6	30-0	2, 9, 15, 16, 17, 20, 21	17-5	27	20-5	22-6	52-9	19-8	31	4	
June	21-5	23-6	23-5	28-5	18-5	30-0	3, 14, 28, 29	16-0	18, 24, 29	19-0	21-9	23-8	12-0	15	2	
July	21-3	24-1	22-5	28-0	17-1	30-0	6, 7, 10	15-0	2, 5, 23, 26, 28, 29	17-8	22-7	Trace	27-31	1	1	
August	24-0	27-2	24-7	30-1	19-3	31-0	4, 5, 6, 7, 8, 13 14/19, 29, 30	18-0	1, 2, 3, 13, 14, 15, 16	20-8	26-2	Nil	Nil	Nil	Nil	
September	24-6	27-6	24-2	30-1	18-4	31-0	1, 2, 3, 4, 5, 6, 7, 8, 28, 29, 30	18-0	1 to 17	20-3	25-7	72-0	51-5	18	2	
October	22-0	25-4	23-9	29-0	18-8	30-0	1, 2, 19, 20, 21, 22, 23, 29	17-5	14, 15	20-5	23-9	19-0	7-1	15	3	
November	22-2	25-3	23-8	28-7	18-9	30-0	1, 9	17-5	18, 20	20-2	23-4	71-1	29-3	29	8	
December	21-7	24-4	23-4	28-4	18-5	29-0	1, 3, 7, 8, 9, 22 to 28, 30, 31	17-5	21, 24, 25, 26, 27	20-0	22-6	166-3	70-2	16	11	

STATION: MANYONI, 1930.

Longitude, 34° 7' E.

Latitude, 5° 39' S.

Altitude, 4,135 feet.

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB		Rainfall in millimetres (Day with rain - 0.2 mm.)		No. of days of rain
	Dry Bulb		Mean of		Date		Absolute Max. and Min.		Date		9 h	14 h	Total for month	Max. In any one day	
	9 h	14 h	4 (Max + Min)	Max.	Min.	Max.	Date	Min.	Date	27	27			Max.	Date
January	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
February	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
March	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
April	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
June	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
July	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
August	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
September	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
October	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
November	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
December	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

APPENDIX V. (Contd.)

STATION : MOSHI, 1930.

Altitude, 2,649 feet.

Longitude, 37° 22' E.

Latitude, 3° 22' S.

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB		Rainfall in millimetres (Day with rain = 0.2 mm.)		No. of days of rain
	Absolute Max. and Min.										In any one day of month		Total for month		
	Dry Bulb		Mean	Means of		Date		Min.	Date	9 h	14 h	Max.	Date		
	9 h	14 h	† (Max + Min)	Max.	Min.	Max.	16	15.0	8, 14, 20, 23	20.8	22.2	16.4	15.6	18	
January	24.8	30.3	24.8	32.7	16.9	36.0	3	16	15.0	20.8	22.2	16.4	15.6	6	
February	23.4	29.4	24.9	31.8	18.1	36.0	3	18	16.0	21.0	21.9	31.9	25.7	5	
March	22.6	26.6	24.2	29.9	18.6	33.0	2, 3, 21, 23	28	16.5	20.8	22.3	251.1	50.6	19	
April	21.6	26.4	22.9	28.0	17.9	33.0	6	10	11.0	20.5	22.3	441.1	98.7	13	
May	19.9	22.7	21.2	24.1	18.4	28.3	8	16, 19, 20, 21, 27, 28, 29, 30	17.0	18.5	20.2	125.3	40.0	8	
June	18.4	22.7	20.0	24.1	16.0	27.0	3	24	10.0	16.7	17.7	6.8	2.5	12	
July	18.5	23.1	19.6	24.2	15.1	27.3	10	26	11.3	16.1	18.6	4.2	4.2	14	
August	18.5	24.0	20.7	25.9	15.5	28.2	13	5, 17	11.0	16.4	17.9	9.4	3.2	17	
September	18.5	26.4	22.5	28.5	16.6	32.0	23, 29	4	13.0	17.9	20.0	12.2	6.2	5	
October	22.0	28.7	23.5	30.1	16.9	34.0	12, 13	6, 11, 12, 13, 14, 22	15.0	18.1	20.6	45.6	31.2	16	
November	22.2	28.1	24.3	30.5	18.2	33.0	2, 6, 7, 17	1, 4, 5	15.0	19.5	21.2	103.5	26.3	16	
December	23.7	30.5	24.5	31.7	17.4	35.0	29	17	15.5	20.2	23.0	11.4	6.5	6	

STATION : KILWA, 1930.

Altitude sea level.

Longitude, 39° 24' E.

Latitude, 8° 57' S.

Month	AIR TEMPERATURE (° CENTIGRADE)										WET BULB		Rainfall in millimetres (Day with rain = 0.2 mm.)		No. of days of rain	
	Absolute Max. and Min.										Total for month		In any one day of month			
	Dry Bulb		Mean	Means of		Date		Min.	Date		9 h	14 h	Max.	Date		Rain
	9 h	14 h	‡ (Max + Min)	Max.	Min.	Max.	16	18	22.0	23	25.5	23.5	170.3	60.2		13
January	27.8	25.9	26.7	29.2	24.3	33.0	3	3	22.0	23	25.5	23.5	25.5	23.5	17	
February	26.1	25.4	25.6	27.4	23.9	30.0	24	9, 11, 12, 13	21.0	24	24.7	23.4	24.7	23.4	10	
March	26.9	28.9	25.3	27.6	23.0	31.0	6	5	21.0	25	25.4	26.4	25.4	26.4	27	
April	27.1	29.2	25.7	27.5	23.9	31.5	1	29	19.0	22	24.5	26.2	24.5	26.2	21	
May	25.9	28.9	24.3	26.5	22.1	30.0	9	20	19.0	22	22.1	23.9	22.1	23.9	19	
June	25.2	27.4	23.9	28.1	19.8	29.5	1, 2, 4, 10, 11, 27	5	17.5	20	20.9	21.5	20.9	21.5	7	
July	24.8	26.9	22.5	25.4	19.6	29.5	9	2	16.5	17	20.7	21.6	20.7	21.6	1	
August	25.2	27.4	23.2	25.3	21.1	27.5	23	17	18.5	2	21.8	22.7	21.8	22.7	2	
September	26.2	27.2	24.4	26.7	22.2	30.0	25	3	19.5	28	22.7	22.5	22.7	22.5	5	
October	28.0	28.3	26.1	28.1	24.2	29.5	14, 21, 27, 28, 29	5.6	22.0	23	23.6	23.5	23.6	23.5	5	
November	28.8	29.8	27.4	29.4	25.5	31.0	20	23	23.5	26	24.9	25.1	24.9	25.1	6	
December	29.6	31.0	28.2	29.8	26.7	31.5	21	23	25.0	26	26.0	26.4	26.0	26.4	7	

APPENDIX VI

TANGANYIKA TERRITORY — RAINFALL AVERAGES (IN MILLIMETRES) TO END OF 1930.

Province	Meteorological Station	Alt. Feet	Lat. S.	Long. E.	Years German Records	Total years records	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Highest Annual Rainfall	Lowest Annual Rainfall	Meteorological Station
Northern...	Arusha ...	4,416	3°23'	36°43'	—	9	49.5	68.2	188.7	310.3	144.0	44.6	17.3	9.7	26.0	67.4	123.0	81.7	1,130.4	1,433.4	835.4	... Arusha
	Mbulu ...	5,900	3°52'	35°37'	3	12	105.3	63.7	172.8	173.9	54.6	3.3	0.9	0.6	11.3	26.1	56.8	99.6	768.9	1,217.0	569.9	... Mbulu
	Moshi ...	2,649	3°22'	37°22'	12	22	18.0	29.1	145.8	302.8	146.1	45.1	22.8	10.9	14.3	36.7	105.8	40.8	918.2	1,204.1	470.0	... Moshi
Tanga ...	Tanga ...	S.L.	5°40'	39°07'	18	28	42.8	77.7	98.0	280.4	186.3	93.5	64.2	77.8	76.1	110.1	149.9	42.9	1,299.7	2,237.1	1,035.8	... Tanga
	Amani ...	3,004	3°06'	38°38'	10	20	80.6	56.7	189.5	307.8	240.9	128.7	94.6	82.4	102.2	142.2	193.9	144.8	1,764.3	2,486.1	1,524.0	... Amani
	Lushoto ...	4,590	4°48'	38°18'	10	20	63.9	65.5	170.2	210.8	177.0	53.6	34.7	16.7	16.4	42.2	121.0	93.3	1,065.3	1,451.4	968.6	... Lushoto
	Sakarre ...	4,500	5°00'	38°26'	8	16	55.2	63.2	148.8	313.0	334.9	146.3	122.0	55.9	88.3	103.7	153.5	75.2	1,660.0	1,893.6	1,509.9	... Sakarre
	Pangani ...	S.L.	5°27'	39°00'	12	21	31.3	39.9	107.0	194.4	122.3	71.9	49.1	32.9	43.5	73.7	147.5	105.2	1,018.7	1,576.8	79.8	... Pangani
Eastern ...	Dar es Salaam ...	30	6°50'	39°17'	19	28	79.1	76.3	185.8	263.2	128.9	34.5	29.3	36.3	19.6	19.7	99.6	90.9	1,063.2	1,297.9	591.0	... Dar es Salaam
	Msimbazi Mission ...	—	6°50'	39°17'	—	6	81.0	70.1	186.0	253.0	82.1	54.4	12.7	22.5	6.9	33.3	131.6	96.4	1,030.0	1,311.7	758.9	... Msimbazi Mission
	Bagamoyo ...	S.L.	6°25'	38°55'	14	23	116.7	67.5	144.8	151.5	101.5	32.0	28.0	25.3	20.8	22.3	84.8	104.5	899.7	1,260.5	621.5	... Bagamoyo
	Utete ...	327	8°00'	38°45'	—	9	76.0	104.2	227.8	182.6	27.6	6.1	2.1	3.1	22.9	9.3	59.3	63.4	784.4	961.0	580.8	... Utete
	Mpanganya ...	105	8°05'	38°40'	5	11	126.4	116.6	194.5	190.8	30.1	4.1	7.3	3.2	28.9	10.5	49.1	63.2	824.7	1,120.7	643.0	... Mpanganya
	Morogoro ...	1,628	6°48'	37°01'	7	15	108.7	93.5	196.7	161.7	58.0	19.6	12.3	9.9	16.1	18.4	25.4	113.4	833.7	964.7	643.8	... Morogoro
	Kilosa ...	1,606	6°48'	37°46'	12	20	172.9	93.3	236.9	179.4	43.3	8.4	8.7	6.4	14.1	8.0	36.5	160.5	968.4	1,045.8	781.4	... Kilosa
	Ngerengere ...	641	6°47'	37°46'	—	9	74.1	58.8	234.7	167.4	53.4	21.1	15.7	14.3	44.3	52.4	89.0	75.8	901.0	1,370.4	737.2	... Ngerengere
	Soga ...	508	6°52'	38°60'	—	6	111.7	97.8	219.5	186.9	51.0	13.3	8.3	28.0	23.5	36.5	118.3	160.4	1,055.2	1,236.5	837.1	... Soga
	Ruvu Estate ...	300	6°48'	38°45'	—	6	65.0	91.1	172.5	122.7	54.5	13.4	15.7	8.1	33.5	61.5	114.9	87.9	840.8	1,120.2	650.0	... Ruvu Estate
Lindi ...	Lindi ...	S.L.	10°00'	39°43'	14	22	168.0	125.4	186.3	159.4	21.9	2.3	10.4	2.8	3.9	20.1	33.4	118.5	852.4	1,058.4	573.3	... Lindi
	Tunduru ...	2,300	11°05'	37°27'	—	9	270.4	279.7	188.7	69.3	19.6	0.8	0.5	16.1	3.8	25.1	10.1	124.9	1,009.0	1,227.6	549.1	... Tunduru
	Masasi Mission ...	1,500	10°42'	38°53'	4	13	224.4	191.1	219.7	134.2	11.5	0.9	0.9	1.8	20.2	19.1	62.1	122.1	1,008.0	1,221.6	637.0	... Masasi Mission
	Ndanda ...	934	10°28'	39°04'	—	6	208.3	174.3	208.2	143.4	53.7	5.7	0.1	7.2	57.4	22.9	141.2	193.3	1,215.7	1,737.0	752.4	... Ndanda
	Mikindani ...	1,016	10°16'	40°07'	10	15	296.3	136.1	198.5	116.1	46.7	5.0	10.4	6.1	19.5	16.1	30.9	110.4	992.1	1,424.3	752.4	... Mikindani
	Kilwa ...	S.L.	8°57'	39°24'	14	23	148.6	131.9	350.5	149.5	28.1	6.1	3.1	7.3	19.6	19.7	24.6	61.3	950.3	1,480.9	470.2	... Kilwa
	Liwalé ...	1,500	9°45'	38°00'	—	9	145.0	175.1	142.1	126.0	10.3	0.1	0.6	1.1	2.2	10.5	24.8	112.7	750.5	1,229.8	410.3	... Liwalé
Central ...	Dodoma ...	1,129	6°11'	35°46'	—	9	164.1	72.8	17.0	47.1	1.5	0.0	0.0	0.0	13.3	2.1	4.5	116.2	592.0	722.5	220.8	... Dodoma
	Mpwapwa ...	—	—	—	—	5	149.9	94.1	147.2	71.6	9.3	1.1	1.2	0.6	15.4	6.1	17.0	80.9	594.4	941.7	439.6	... Mpwapwa
	Manyoni ...	4,096	6°15'	34°35'	—	6	194.8	77.5	175.0	91.1	2.8	0.1	0.0	0.0	15.1	2.4	16.6	95.2	670.6	875.9	332.6	... Manyoni
	Singida ...	5,233	4°48'	34°45'	3	11	121.7	88.1	130.6	83.7	13.4	0.5	4.1	0.0	7.4	4.0	17.5	107.7	578.7	749.6	495.0	... Singida
	Mvumi Mission ...	3,500	5°00'	35°00'	—	6	122.9	66.9	146.0	57.2	2.5	0.0	0.0	0.0	14.1	2.2	7.0	83.7	502.5	691.2	340.0	... Mvumi Mission
	Kondoa Irangi ...	4,610	4°57'	35°38'	9	17	161.0	104.1	190.8	86.8	37.6	0.3	0.0	0.0	8.0	9.5	25.2	129.4	752.7	1,211.1	281.1	... Kondoa Irangi
	Mkalama ...	4,235	4°00'	35°00'	4	11	124.8	73.6	187.7	169.2	29.1	2.9	2.9	7.0	24.2	30.8	46.1	128.8	827.1	1,101.9	520.0	... Mkalama
Tabora ...	Tabora ...	4,000	5°00'	32°00'	14	22	120.6	121.1	195.3	152.0	8.6	0.8	0.9	2.8	31.4	9.8	83.9	150.6	877.8	1,303.4	546.0	... Tabora
	Kahama ...	4,055	3°35'	32°33'	—	9	113.3	114.4	189.0	224.1	31.9	3.8	6.4	3.2	29.9	54.2	133.4	146.1	1,049.7	1,293.2	739.3	... Kahama
	Kola Ndola Mission ...	4,000	3°34'	33°19'	—	8	90.7	90.3	145.8	95.6	21.3	2.4	1.6	0.1	5.3	27.0	69.0	106.9	656.0	892.7	507.5	... Kola Ndola Mission
	Lohombo Mission ...	4,400	4°00'	33°19'	—	5	77.8	114.6	179.9	180.9	23.4	3.0	4.2	0.9	56.9	36.5	90.3	145.4	913.8	—	725.3	... Lohombo Mission
	Nzega ...	4,000	4°15'	33°08'	—	6	126.5	92.9	131.9	174.8	30.3	1.0	7.6	1.9	26.3	25.6	112.3	135.3	866.4	1,072.4	619.1	... Nzega
	Ibadakuli ...	—	—	—	—	3	55.1	130.3	174.3	78.8	17.3	3.2	9.2	0.7	36.8	42.5	53.3	150.3	751.8	995.3	471.9	... Ibadakuli
Kigoma ...	Kigoma ...	2,531	4°52'	29°28'	—	9	67.2	103.0	149.3	123.5	39.9	12.1	3.7	0.8	33.0	37.8	104.3	178.2	852.8	1,165.4	482.8	... Kigoma
	Ujiji ...	2,738	4°59'	29°47'	9	18	147.4	144.7	246.2	149.7	42.9	2.1	2.3	1.7	20.7	48.2	137.9	228.9	1,172.7	1,318.4	665.6	... Ujiji
	Kasulu ...	4,530	4°35'	30°07'	—	9	144.5	124.2	157.5	155.7	31.8	10.6	2.3	5.0	15.0	70.4	97.6	133.5	948.1	—	—	... Kasulu
	Uvinza ...	—	—	—	—	3	77.9	176.2	127.0	128.9	8.9	0.0	2.3	0.0	46.5	67.8	74.9	133.8	844.2	1,041.7	625.5	... Uvinza
Iringa ...	Iringa ...	5,365	7°43'	35°40'	5	13	144.1	131.3	227.5	79.3	8.3	0.3	0.1	0.0	11.0	4.5	24.5	105.6	736.5	934.4	524.7	... Iringa
	Tukuyu ...	5,300	9°15'	33°38'	9	19	289.9	216.3	483.0	645.8	255.3	72.9	105.8	61.2	44.9	38.7	80.2	180.5	2,474.5	2,861.2	2,102.9	... Tukuyu
	Madibira Mission ...	3,630	8°10'	34°08'	4	10	181.4	142.9	136.3	96.1	4.7	0.0	0.0	0.0	10.4	13.6	51.8	88.9	726.1	1,135.5	567.9	... Madibira Mission
	Musekera Estate ...	3,800	9°15'	33°38'	—	5	278.3	192.1	486.7	625.0	278.6	72.0	69.6	47.9	29.3	21.6	58.1	177.7	2,336.9	2,770.2	2,138.1	... Musekera Estate
Mahenge ...	Mahenge ...	3,352	8°40'	36°43'	9	19	227.4	172.6	342.6	229.0	39.5	13.6	8.9	7.6	7.0	18.9	28.8	138.8	1,234.7	2,106.2	730.4	... Mahenge
	Songea ...	3,826	10°42'	35°40'	10	19	276.9	225.5	271.9	108.1	8.9	0.6	1.3	0.1	2.9	8.8	15.1	147.8	1,068.1	1,328.2	667.7	... Songea
	Ifakara Mission ...	—	—	—	—	4	161.4	80.5	317.7	237.4	57.8	14.8	2.8	3.9	14.9	10.8	27.3	101.9	1,031.2	1,154.5	838.8	... Ifakara Mission
Mwanza ...	Mwanza ...	3,709	2°32'	32°53'	11	20	50.4	117.8	203.3	230.3	61.0	21.0	40.4	8.9	35.4	75.6	86.1	148.8	1,079.0	—	841.9	... Mwanza
	Musoma ...	3,709	1°28'	33°47'	—	8	50.7	39.4	97.7	142.1	90.6	12.5	16.5	35.3	24.6	45.7	61.0	116.1	732.2	1,011.8	641.3	... Musoma
Bukoba ...	Bukoba ...	3,709	1°20'	31°47'	11	21	138.2	180.3	291.5	347.3	224.6	66.4	39.0	85.2	94.1	104.3	138.2	191.2	1,900.3	2,330.1	1,553.4	... Bukoba
	Kagondo Mission ...	4,252	1°18'	31°15'	4	13	69.2	132.8	210.4	282.2	210.9	57.1	32.5	41.3	59.4	82.2	128.8	146.1	1,452.9	1,939.2	1,439.1	... Kagondo Mission
	Rubaya ...	—	—	—	—	3	94.3	179.6	230.5	242.0	84.9	34.5	23.1	32.1	64.2	158.6	126.5	126.5	1,396.8	1,413.7	1,379.9	... Rubaya
	Igabi Estate ...	—	—	—	—	2	103.9	143.8	221.2	198.7	57.9	23.3	23.0	37.9	25.9	115.2	81.3	125.0	1,157.1	1,218.4	1,095.9	... Igabi Estate
	Mugana Mission ...	—	—	—	—	2	73.9	137.9	248.3	281.0	88.4	21.9	40.6	20.7	110.6	141.3	116.9	83.0	1,354.5	1,403.0	1,326.1	... Mugana Mission
	Biharamulo ...	4,350	2°42'	31°26'	—	9	104.2	88.7	166.8	236.7	76.0	16.1	17.9	19.5	38.2	75.9	89.7	177.9	1,047.6	1,169.6	582.0	... Biharamulo

